



# **Agilent N9340A Handheld Spectrum Analyzer**

## **User's Guide**



Agilent Technologies

# Notices

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## Software Revision

This guide is valid for A.01.00 revisions of the Agilent N9340A Handheld Spectrum Analyzer software.

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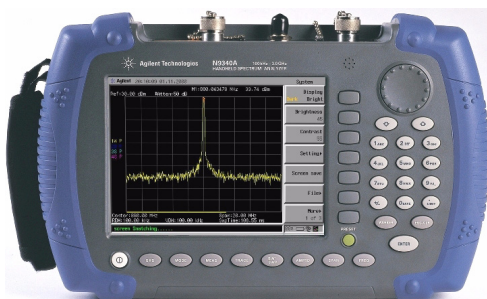
# 1

## N9340A Overview



### Introduction

An Agilent N9340A is a handheld spectrum analyzer with a frequency ranges from 100 kHz to 3 GHz. The analyzer provides ultimate measurement flexibility in a package that is ruggedized for field environments and convenient for mobile applications.



### Functionality

The Agilent imbued N9340A provides you a comprehensive functionality set, including:

- 1 Pass/Fail judgement**  
Sets limit lines on the display for a quick Pass/Fail judgement.
- 2 Four-trace detection display**  
Displays as many as four independent traces simultaneously, being detected in any of the following modes: POS, NEG, Sample or Normal.
- 3 Marker frequency readout**  
Provides a resolution low to 1 Hz with a built-in frequency counter.

#### 4 Power Suite

Provides one-button measurement functionality on OBW (Occupied Bandwidth), channel power, ACPR (Adjacent Channel Power Ratio) and SEM (Spectrum Emission Mask).

#### 5 High sensitive measurement

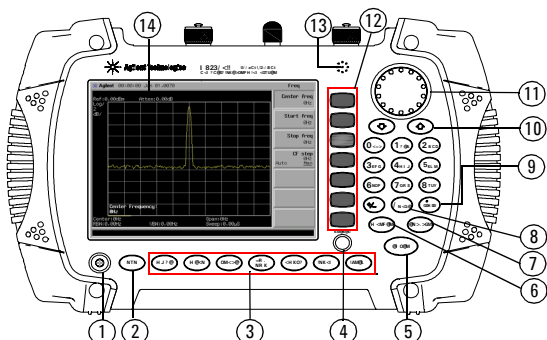
Includes a 3 GHz pre-amplifier (Option N9340A-PA3), enabling highly sensitive measurement which helps in analysis of low level signals.

## Enhanced Usability

An Agilent N9340A handheld spectrum analyzer also provides you enhanced usabilities:

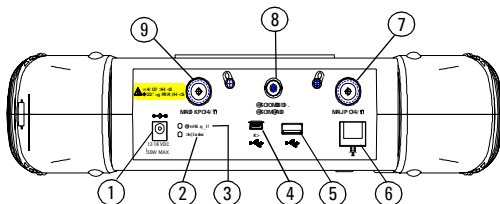
- 7.2 inch transflective display ( 640 × 480 pixels) enables to read the screen easily and clearly under high light level.
- Arc-shaped handle and rugged rubber casing ensure a comfortable and firm hold.
- One-button measurement function provides an easy and fast access to the power measurement.
- Convenient firmware updating via USB interface.
- Continuously pressing [**Preset**] hardkey turns off the screen. Press any key on the front panel to activate the screen.

## Front Panel Overview



Caption	Function
1 Power Switch	Toggles the analyzer between on and off
2 SYS	Brings up a submenu for system setups
3 Function keys	Includes hardkeys: <b>FREQ</b> , <b>SPAN</b> , <b>AMP</b> , <b>BW/SWP</b> , <b>TRACE</b> , <b>MEAS</b> , and <b>MODE</b>
4 Preset	Returns the analyzer to a known state
5 Enter	Confirms a selection or configuration
6 MARKER	Activates marker function
7 ESC/CLR	Escapes the dialog box or clears the character input
8 Save	Saves the current traces when numeric keypad is restrained
9 LIMIT	Sets limit lines for quick Pass/Fail judgement
10 Arrow keys	Increases or decreases a parameter step by step
11 Knob	Selects an option item or edits a numerical parameter
12 Softkeys	Indicates current menu functions
13 Speaker	Speaks when in demodulation mode
14 Screen	Displays measured traces and status

## Top Panel Overview



### 1. DC Connector

Provides input for the DC power source via an AC-DC adapter. Make sure that the line-power source outlet has a protective ground contact.

### 2. Charging indicator

Lights when the battery is charging.

### 3. External power indicator

Lights when an external DC power is input to the analyzer via the AD-DC adapter.

### 4. USB interface (for PC connection) <sup>PC</sup>



Provides a connection between the analyzer and a PC for data transfer of further process.

### 5. USB interface



Provides an connection between the analyzer and a USB memory disk.

### 6. LAN Interface (For future expansion)

### 7. RF OUT Connector (For future expansion)

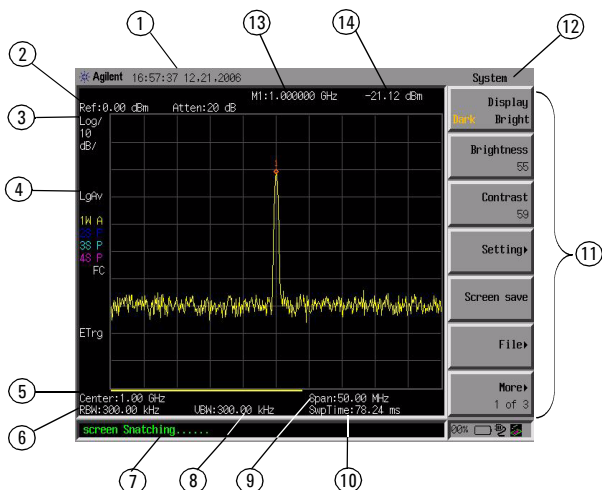
### 8. EXT TRIG IN/REF IN (BNC, Female)

Connects to an external TTL signal or a 10 MHz reference signal. The TTL signal is used to trigger the analyzer's internal sweep.

### 9. RF IN Connector (Type N, Female)

Accepts an external input with a frequency ranges from 100 kHz to 3 GHz.

## Display Annotations



Description	Associated Function Key
1 Time and Date	[SYS] > {Setting} > {General}
2 Reference Level	[AMPTD]
3 Amplitude Scale	[AMPTD]
4 Detector Mode	[TRACE] > {More (1 of 2)} > {Detector}
5 Center Frequency	[FREQ] > {Center Freq}
6 Resolution Bandwidth	[BW/SWP] > {RBW}
7 Display Status Line	Displays analyzer status and error messages.
8 Video Bandwidth	[BW/SWP] > {VBW}
9 Frequency Span	[SPAN]
10 Sweep Time	[BW/SWP] > {Sweep Time}
11 Key Menu	See key label description in the key reference for more information.
12 Key Menu Title	Refers to the current activated menu function
13 Marker Frequency	[Marker]
14 Marker Amplitude	[Marker]

## Working with Batteries

Use the original battery supplied with the instrument.

### Installing a Battery

**CAUTION**

Insert a battery with electrodes physically attached properly.



Step	Notes
1 Open the battery cover	Use a cross type screwdriver to loose the screw, then pull the cover open.
2 Insert the battery	
3 Close the battery cover	Push the cover closed, then ref-fasten the screw.

### Viewing Battery Status

Determine the battery status in either of the following ways:

- Check the battery icon in the lower right corner of the front panel screen which indicates the approximate level of charge.
- Press **[SYS] > {More (1 of 3)} > {Show System} > {Page down}** to check the current battery information.

### Charging a Battery

You can only charge the battery when it is in the analyzer. Fully charge the battery when for the first use.

#### CAUTION

Never use a modified or damaged charger.

---

### Internal Charging

Use your N9340A to recharge the battery while the analyzer is operating or shut down.

- 1 Install the battery in the analyzer.
- 2 Simply attach the AC-DC adapter and switch on external power.
- 3 The charging indicator lights, indicating that the battery is charging. When the battery is fully charged, the green charging indicator turns off.

#### NOTE

For a fully depleted battery, the charging time is approximately three hours if the analyzer shut down, longer time is needed if the analyzer is operating.

---

During charging and discharging, the battery will monitor and report its voltage, current, and temperature. If any of these monitored conditions exceed their safety limits, the battery will terminate any further charge or discharge until the error condition is corrected.





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## 2

## Getting Started



### Checking Shipment and Order List

We recommend you check the shipment and order list according to following procedures when you receive the shipment.

- Inspect the shipping container for damages. Signs of damage may include a dented or torn shipping container or cushioning material that indicates signs of unusual stress or compacting.
- Carefully remove the contents from the shipping container, and check your shipment.
- For any question or problem, contact Agilent Technologies Customer Contact Center (CCC) for consultant and service. See [“Contact Agilent Technologies”](#) on page 30.

## Power Requirements

The AC power supply must meet the following requirements:




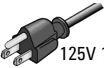

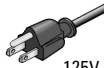


<b>Voltage:</b>	100 VAC to 240 VAC
<b>Frequency:</b>	50 Hz to 60 Hz
<b>Power:</b>	Maximum 62 W

The analyzer is equipped with a three-wire power cord, in accordance with international safety standards. This cable grounds the analyzer cabinet when connected to an appropriate power line outlet. The cable appropriate to the original shipping location is included with the analyzer.

Various AC power cables are available that are unique to specific geographic areas. You can order additional AC power cables for use in different areas. The table AC Power Cords lists the available AC power cables, the plug configurations, and identifies the geographic area in which each cable is appropriate.

The detachable power cord is the product disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the product. The front switch is only a standby switch and do not disconnect instrument from LINE power.

### AC Power Cords

Plug Type	Cable Part Number	Plug <sup>a</sup> Description	For use in Country & Region
 250V 10A	8121-1703	BS 1363/A	Option 900 United Kingdom, Hong Kong, Singapore, Malaysia
 250V 10A	8120-0696	AS 3112:2000	Option 901 Australia, New Zealand
 250V 16A	8120-1692	IEC 83 C4	Option 902 Continental Europe, Korea, Indonesia, Italy, Russia
 125V 10A	8120-1521	CNS 10917-2 / NEMA 5-15P	Option 903 United States, Canada, Taiwan, Mexico
 250V 10A	8120-2296	SEV 1011	Option 906 Switzerland
 230V 15A	8120-4600	SABS 164-1	Option 917 South Africa, India
 125V 15A	8120-4754	JIS C8303	Option 918 Japan
 250V 16A	8120-5181	SI 32	Option 919 Israel
 250V 10A	8120-8377	GB 1002	Option 922 China

## Safety Considerations

Agilent has designed and tested the N9340A handheld spectrum analyzer for Measurement, Control and Laboratory Use in accordance with Safety Requirements IEC 61010-1: 2001, UL 61010-1 (2004), and CSA C22.2 No.61010-1-04.

The tester is supplied in a safe condition.

The N9340A is also designed for use in Installation Category II and Pollution Degree 2 per IEC 61010 and IEC 60664 respectively.

Read the following safety notices carefully before you start to use a N9340A handheld spectrum analyzer to ensure safe operation and to maintain the product in a safe condition.

**WARNING**

**Personal injury may result if the analyzer's cover are removed. There are no operator-serviceable parts inside. Always contact Agilent qualified personnel for service. Disconnect the product from all voltage sources while it is being opened.**

---

**WARNING**

**This product is a Safety Class I analyzer (provided with a protective earth ground incorporated in the power cord). The main plug should be inserted in a power socket outlet only if provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the product is likely to make the product dangerous. Intentional interruption is prohibited.**

---

**WARNING**

**Electrical shock may result when cleaning the analyzer with the power supply connected. Do not attempt to clean internally.**

---

**WARNING**

**Always use the three-pin AC power cord supplied with this product. Failure to ensure adequate earth grounding by not using this cord may cause personal injury and product damage.**

---

## 2 Getting Started

### WARNING

**Danger of explosion if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended.**

---

### WARNING

**Do NOT dispose of batteries in a fire.**

**Do NOT place batteries in the trash. Batteries must be recycled or disposed of properly.**

---

### CAUTION

Recharge the battery only in the analyzer.

If left unused, a fully charged battery will discharge itself over time.

Never use a damaged or worn-out adapter or battery.

If you are charging the batteries internally, even while the analyzer is powered off, the analyzer may become warm. To avoid overheating, always disconnect the analyzer from the AC adapter before storing the analyzer into the soft carrying case.

---

### NOTE

Temperature extremes will affect the ability of the battery to charge. Allow the battery to cool down or warm up as necessary before use or charging.

Storing a battery in extreme hot or cold places will reduce the capacity and lifetime of a battery.

Battery storage is recommended at a temperature of less than 45 °C.

---

### NOTE

Use a dry or slight plain water wetted soft cloth to clean the outside case only.

---

## Environmental Requirements

A N9340A is designed for use under the following conditions:

- Operating temperature:  $-10^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$
- Storage temperature:  $-40^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$
- Humidity: 95% or less
- Altitude: 3000 m

## Electrical Requirements

This analyzer allows you to use either the original lithium-ion battery pack or the external AC-DC adapter shipped with the analyzer for power supply to the analyzer.

## Electrostatic Discharge (ESD) Precautions

This analyzer was constructed in an ESD protected environment. This is because most of the semiconductor devices used in this analyzer are susceptible to damage by static discharge.

Depending on the magnitude of the charge, device substrates can be punctured or destroyed by contact or mere proximity of a static charge. The result can cause degradation of device performance, early failure, or immediate destruction.

These charges are generated in numerous ways, such as simple contact, separation of materials, and normal motions of persons working with static sensitive devices.

When handling or servicing equipment containing static sensitive devices, adequate precautions must be taken to prevent device damage or destruction. Only those who are thoroughly familiar with industry accepted techniques for handling static sensitive devices should attempt to service circuitry with these devices.

### Instrument Markings



The CE mark shows that the product complies with all relevant European Legal Directives  
(If accompanied by a year, it signifies when the design was proven).



The CSA mark is a registered trademark of the Canadian Standards Association.



The C-Tick mark is a registered trademark of the Australian Spectrum Management Agency.



This symbol is an Industrial Scientific and Medical Group 1 Class A product (CISPR 11, Clause 4)



The instruction manual symbol: indicates that the user must refer to specific instructions in the manual.



The standby symbol is used to mark a position of the instrument power switch.



## Power on the Analyzer for the First Time

A N9340A is fitted with a transfective screen, which is viewable under all lighting conditions. In bright lighting conditions, the display is brighter and easier to read when you allow light to fall directly on the screen.

**CAUTION**

Use original standard adapter for AC-DC conversion.

The maximum RF input level of an average continuous power is 33 dBm (or  $\pm 50$  VDC signal input). Avoid connecting a signal into the analyzer that exceeds the maximum level.

## Power on your N9340A

Insert the battery into the analyzer or connect the analyzer to an external line power supply via the AC-DC adapter, then press the power switch on the front panel of your N9340A to power on the analyzer.

Allow the analyzer to warm-up for 30 minutes before making a calibrated measurement. To meet its specifications, the analyzer must meet operating temperature conditions.



### Preparation for Use

Use **[SYS]** hardkey to check or set the system settings of your analyzer.

#### Setting up your N9340A

- 1 Press **[SYS] > {Setting} > {General}** to set time and power saving mode:
  - Press **{Time/Date}** to set the time and date for your analyzer.
  - Press **{Power Manager}** to select a power saving mode from the follow three modes: turning off backlight, turning off screen display, and turning off both backlight and screen display.
- 2 Press **[SYS] > {Setting} > {Language}** to select a language displayed on screen.
- 3 A N9340A allows you to manually adjust the display brightness and contrast.
  - Press **[SYS] > {Brightness}** and then rotate the knob to adjust display brightness.
  - Press **[SYS] > {Contrast}** and then rotate the knob to adjust display contrast.
- 4 Press **[SYS] > {More(2 of 3)} > {Key Beep}** to toggle the buzzer beep function between on and off.

#### Testing key stroke and screen pixel

- 1 Press **[SYS] > {More (2 of 3)} > {Diagnostics} > {Front Panel}** to test all the front panel keys except the **[PRESET]** hardkey and power switch.
- 2 Press **[SYS] > {More (2 of 3)} > {Diagnostics} > {Black Pixel}** or **{White Pixel}** to check the LCD pixel.

## Checking Instrument Information

- 1 Press **[SYS] > {More (1 of 3)} > {Show System}** to display the system information.
- 2 Press **[SYS] > {More (2 of 3)} > {Option}** to display the option information.
- 3 Press **[SYS] > {More (1 of 3)} > {Show Error}** to display the error information.

# Making a Basic Measurement

This section provides information on basic analyzer operations with the assumption that you understand the front and top layout, and display annotations of your analyzer. If you do not, please refer to “[Front Panel Overview](#)” on page 10 and “[Top Panel Overview](#)” on page 11.

For more information on making measurements, please refer to “[Making Measurements](#)” on page 43”.

## Entering Data

When setting measurement parameters, there are several ways to enter or modify the value of an active function:

### 1 Using Knob

Increases or decreases the current value.

### 2 Using Arrow Keys

Increases or decreases the current value by step.

Press **[FREQ] > {CF Step}** to set the frequency by an auto-coupled step ( $\text{Step} = \text{Span}/10$ , when **{CF Step}** mode is set to **Auto**).

### 3 Using Numeric Keypad

Enters a specific value. Then press a terminator (either a specified unit softkey or **[ENTER]**) to confirm input.

### 4 Using Unit Softkeys

Terminates a value input which requires a unit.

### 5 Using Enter Key

Terminates an entry or confirms a selection.

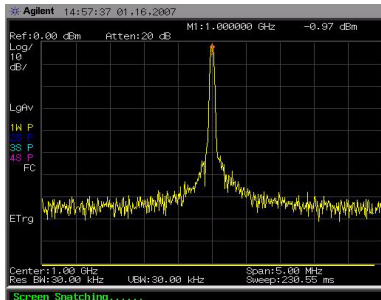
## Viewing a Signal

- 1 Use a signal generator to generate a continuous wave signal (1 GHz, 0 dBm).
- 2 Press **[SYS] > {More (1 Of 3)} > {Preset}** and select **Default** to toggle the preset setting to factory-defined status.
- 3 Press the green **[Preset]** key to restore the analyzer to its factory-defined setting.
- 4 Connect the generator's **RF OUT** connector to analyzer's **RF IN** connector on the top panel.
- 5 Press **[FREQ] > {Center Freq} > 1 > {GHz}** to set the center frequency to 1 GHz.
- 6 Press **[SPAN] > 5 > {MHz}** to set the frequency span to 5 MHz.
- 7 Press **[MARKER] > {Peak Search} > {Peak}** to place a marker (labeled 1) at the highest peak (1 GHz) on the display.

The value of amplitude and frequency of the Marker appear both in the function block and in the up-right corner of the screen.

Use the knob, the arrow keys, or the softkeys in the Peak Search menu to move the marker and read out the value of both frequency and amplitude displayed on the screen.

**Figure 1 View a signal (1 GHz, 0 dBm)**



### Some helpful tips

#### Performing a time-base calibration

A N9340A provides a manual calibration function to calibrate the time base.

Before calibration, allow the analyzer to warm up for about 30 minutes.

Use a BNC cable to connect a 10 MHz reference signal to the **EXT TRIG IN** connector of your N9340A, then press **[SYS] > {More (2 of 3)} > {Calibration} > {Time Base}** to initiate a calibration.

#### Selecting a preset type

The analyzer has two types of preset setting for you to choose:

- **Default**  
Restores the analyzer to its factory-defined setting.
- **User**  
Restores the analyzer to a user-defined setting.

#### NOTE

Powering on the instrument always brings up a factory-defined setting no matter the Preset setting.

#### How to Save a User-defined Preset

If you constantly use system setting which is not the factory default, please refer to the following steps to create a user-defined system setting:

- 1 Set analyzer parameters by the knob, the arrow keys or the numeric keypad.
- 2 Press **[SYS] > {More (1 of 3)} > {Preset} > {Save User}** to save the current parameters as the user preset setting.
- 3 Press **[SYS] > {More (1 of 3)} > {Preset} (User)** to set the preset mode to user defined system setting.

## Upgrading Firmware

**CAUTION**

**Make sure at least 10 minutes consistently power supply when updating firmware. Power cut off during the updating process can make damage to the instrument.**

---

A N9340A provides an easy and fast access for firmware upgrade.

- 1 Setup a folder named N9340DATA in the root directory of your USB memory stick.
- 2 Download the firmware update package from Agilent website ([www.agilent.com/find/n9340a](http://www.agilent.com/find/n9340a)) into the folder named N9340DATA.
- 3 Insert the USB memory stick into the USB connector on the top panel of your analyzer.
- 4 Press **[SYS] > {More (2 of 3)} > {Upgrade} > {Firmware}** active the inner updating procedure. Then the instrument will perform the upgrading process automatically.

### Adding an option

Pressing **[SYS] > {More (2 of 3)} > {Option} > {Add}** brings up a dialog box for entering the option license code. Use the numeric keypad to input the option license code and use the **[Enter]** key as a terminator. If the option license code is identified, an annotation “Option install successfully” will appear in the status line, else an annotation “Invalid option licence” will appear in the status line.

# Contact Agilent Technologies

Agilent has set Sales and Service Offices around the world to provide you with complete support. Go to <http://www.agilent.com/find/assist>, for help with:

- product selection, configuration, and purchases.
- technical and application assistance, and consulting.
- rental and leasing options, and refurbished equipment.
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If you do not have access to the internet, call the appropriate number shown below. Or contact your local Agilent Technologies Sales and Service Office.

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Korea	(tel) 080 769 0800 (fax) 080 769 0900
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Europe	(tel) +31 20 547 2111
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Agilent N9340A  
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# 3 System Setting



# Visual and Audio Adjustment

## Quick Display Adjustment

The analyzer provides you a quick adjustment on both brightness and contrast.

Press **[SYS] > {Display}** to toggle the display status between **Dark** and **Light**.

## Manual Display Adjustment

### Adjusting Brightness

Press **[SYS] > {Brightness}** then rotate the knob to adjust display brightness.

### Adjusting Contrast

Press **[SYS] > {Contrast}** then rotate the knob to adjust display contrast.

## Setting Key Beep

Activates the Key Beep function as an indicator of key operation.

Key Access: **[SYS] > {More (2 of 3)}**

## System Setting

Includes general system settings, displayed language setting, and external input setting.

### General system settings

Provides the following system setting options:

#### Time/Date

Press **[SYS] > {Setting} > {General} > {Time/Date}** to set the date and time of the analyzer.

The analyzer requires you to input the time in a HHMMSS format, and the date in a YYYYMMDD format.

#### Power Manager

Press **[SYS] > {Setting} > {General} > {Power manager}** to select a power saving mode from the followings. All of the three modes provide choices for setting time limit as 5 minutes, 15 minutes, 30 minutes or 4 hours.

- **Backlight**  
The analyzer turns off the backlight of the LCD screen at a pre-defined time limit. Press any key to re-activate the backlight after the backlight saving mode is triggered.
- **LCD**  
The analyzer turns off the LCD display at a pre-defined time limit. Press any key to re-activate the LCD display after the LCD display saving mode is triggered.
- **Backlight & LCD**  
The analyzer turns off the both the LCD display and the backlight at a pre-defined time limit. Press any key to re-activate the backlight and LCD display after the backlight and LCD saving mode is triggered.

## Ext Input

#### NOTE

The external **Ref** and **Trig** functions are not available at the same time.

---

Toggles the channel for external input between Ref and Trig. Ref refers to a 10 MHz reference signal, and Trig refers to a TTL signal.

Key Access: **[SYS] > {Setting} > {Ext Input}**

### External Reference (Ref)

Use the external reference function as follows:

- 1 Input a 10 MHz signal to the **EXT TRIG IN/REF IN** connector.
- 2 Press **[SYS] > {Setting} > {Ext Input} > {Ref}** to enable the external reference signal input.

Then the analyzer will turn off its internal reference.

### External Trigger (Trig)

When use an external TTL signal for triggering function, the analyzer will use the inner reference as default.

Use the external trigger function as follows:

- 1 Press **[SYS] > {Setting} > {Ext Input} > {Trig}** to enable the external TTL signal input.
- 2 Press **[SPAN] > {Zero Span}** to activate the **Trigger** function.
- 3 Access the associated softkeys to select the threshold of the trigger condition at the raised edge (**Ext Rise**) or the fallen edge (**Ext Fall**).

#### NOTE

The trace will halt in external trigger mode till the trigger threshold is met or the free run function is activated.

---

## Quick Saving State

Press **[SYS] > {Setting} > {Save State}** to save the current system settings and current measurement parameters to the local memory of the analyzer.

### Tips:

The analyzer generates a default file name for saving your first state file (HYSTATE.STA). You can decide whether to leverage this file name or modify it.

The analyzer also provides a legend file naming utility that it generates consecutive state file names by adding Arabic numbers to the latest saved file name.

### NOTE

This quick saving utility of system state is equal to the system state saving utility under the **[SYS] > {File}**.

---

## Recalling State

- **Load default**

Press **[SYS] > {Setting} > {Recall state} > {Load default}** to recall the factory default setting.

- **User state**

Press **[SYS] > {Setting} > {Recall state} > {User state}** to recall a system state that has been saved in the local memory before.

# File

Pressing **[SYS] > {File}** accesses to the menu that allows you to manage the file saving and loading of the analyzer.

## Quick saving a trace

Pressing **[ESC/CLR] > [Save]** allows you to quickly save a trace to the local memory or the USB according to your setup of saving path. For more information about file setup please refer to “[Saving a file](#)” on page 36.

## Viewing file list

Refer to the following two steps to view file list:

- 1 Select which directory you would view.  
Press **[SYS] > {File} > {View}** to toggle the displayed file list from **local** memory or an external **USB** memory stick.
- 2 Select which file type you would view.  
Press **[SYS] > {File} > {File setup} > {File type}** to select a file type.

## Saving a file

### NOTE

After you select a file type, you need to edit a file name by pressing the numeric and alphabetic hardkeys on the right side of the analyzer's front panel.

Refer to the following three steps to save a file:

- 1 Press **[SYS] > {File} > {File setup}** to select the save path and file type.
- 2 Edit a file name.  
One single key stroke on the numerical keypad inputs a digital number, and consecutive key stroke selects and inputs a letter.
- 3 Press **{Save}** to save the file.

When a file saving completes, the message “File Saved” appears on the bottom line of the screen.

## File Type

A N9340A provides six types of files and the related available operation is listed as followings:

- Trace (\*.DAT)
- Screen (\*.JPG)
- State (\*.STA)
- Pattern (\*.PTN)
- SEM (\*.MSK)
- Setup (\*.SET)

## Save Path

The analyzer provides two directories for file saving:

- Local memory
- External USB memory stick

## Deleting a file

### CAUTION

The deleted file can NOT be recovered. Carefully decide whether you need to delete the file(s).

- 1 Press **[SYS] > {File} > {View}** to select a directory.
- 2 Rotate the knob to highlight a file.
- 3 Press **{Delete}** to delete a selected file.

## Loading a file

- 1 Press **[SYS] > {File} > {View}** to select a directory.
- 2 Rotate the knob to highlight a file.
- 3 Press **{Load Now}** to recall a pre-saved file.

## Show System

Displays the following hardware, software and battery information of your analyzer:

Machine Model	Power Source
MCU Firmware Version	Battery Info
DSP Firmware Version	Name
FPGA Firmware Version	Serial NO.
RF Firmware Version	Capacity
RF Module S/N	Temperature
KeyBoard Module S/N	Charge Cycles
Elapsed Time	Voltage
Whole Times	Current
This Run Time	Charge Status
Temperature	Remain Time
Source Voltage	

Key Access: **[SYS] > {More (2 of 3)} > {Show system}**



## Show Error

Accesses a list of the last 30 error messages reported by the analyzer. The most recent error will appear at the bottom of the list. The first listed error will be removed firstly if the error list is longer than 30 entries. When in remote control, the error display will be halted with a specified message at the bottom of the list when the error list is longer than 30 entries.

Key Access: **[SYS] > {More (2 of 3)} > {Show Error}**

## Perform a Time Base Calibration

As soon as the calibration function triggers, the current measurement is interrupted and a gauge displays on the LCD. The gauge simply indicates calibration action rather than calibration course, as the calibration time is unpredictable. When the calibration is finished, a calibration result will display on LCD, and the interrupted measurement will restart.

#### NOTE

Time base calibration can be taken during a short time only when the inner temperature is stable. When the inner temperature is rising up, calibration operation will bring a long-time course or a failure. If the input reference signal is abnormal, it will take a long and unpredictable time to exit, and error shows on the screen.

---

Key Access: **[SYS] > {More (2 of 3)} > {Calibration}**

## Preset

Provides known system settings for making measurements. The analyzer is able to record two types of system settings:

- **Default**  
Restores the analyzer to its factory-defined setting.
- **User**  
Restores the analyzer to user-defined setting.

Key Access: **[SYS] > {More (2 of 3)} > {Preset}**

## Factory Default Settings

Parameter	Default Setting
Center Frequency	1.5 GHz
Start Frequency	0.0 Hz
Stop Frequency	3.0 GHz
Span	3.0 GHz
Reference Level	0.0 dBm
Attenuation	Auto (20 dB)
Scale/DIV	10 dB/DIV
Scale Type	Log
RBW	Auto (1 MHz)
VBW	Auto (1 MHz)
Average Type	Log Power
Sweep time	Auto
Sweep Mode	Normal
Trace 1	Clear write
Trace 2	Blank
Trace 3	Blank
Trace 4	Blank
Trace 1 Detection	Pos Peak
Trace 2 Detection	Pos Peak
Trace 3 Detection	Pos Peak
Trace 4 Detection	Pos Peak
Trace Average	All Off
Marker	All Off
File Type	Trace
Save Path	Local
Mode	Spectrum Analyzer
External Input type	Trigger in (TTL signal input)



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## 4 Making Measurements



# Measuring Multiple Signals

This section provides information on measuring multiple signals.

## Comparing Signals on the Same Screen

A N9340A provides an easy function for you to compare frequency and amplitude differences between signals, such as radio or television signal spectra. Using **Delta Marker** function allows you to compare two signals when both appearing on the screen at one time.

In this following example, a 10 MHz input signal is used to measure frequency and amplitude differences between two signals on the same screen. Delta marker is used to demonstrate this comparison.

- 1 Press [**PRESET**] to set the analyzer to a factory default setting.
- 2 Input a signal (0 dB, 10 MHz) to the **RF IN** connector of the analyzer.
- 3 Set the analyzer start frequency, stop frequency and reference level to view the 10 MHz signal and its harmonics up to 20 MHz:
  - Press [**FREQ**] > {**Start Freq**} > **1** > {**MHz**}
  - Press [**FREQ**] > {**Stop Freq**} > **30** > {**MHz**}
  - Press [**AMPTD**] > {**Ref Level**} > **0** > {**dBm**}
- 4 Press [**MARKER**] > {**Peak search**} to place a marker on the highest peak on the display (10 MHz). The {**Next Left PK**} and {**Next Right PK**} softkeys are available to move the marker from peak to peak.
- 5 Press [**MARKER**] > {**Delta**} to anchor the first marker (labeled as 1) and activate a delta marker:

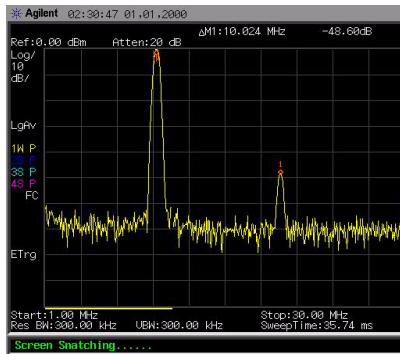
The label on the first marker now reads 1R, indicating that it is the reference point.

- 6 Move the second marker to another signal peak using the front panel knob or by using the **{Peak Search}** softkey:
  - Press **[MARKER] > {Peak Search} > {Next Right PK}** or **{Next Left PK}**.

**NOTE**

To increase the resolution of the marker readings, turn on the frequency count function. For more information, please refer to [“Improving Frequency Resolution and Accuracy”](#) on page 54

**Figure 2 Delta pair marker with signals on the same screen**



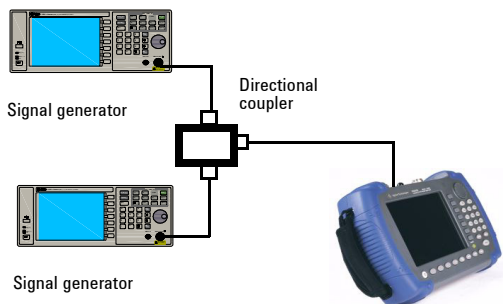
### Resolving Signals of Equal Amplitude

In this example a decrease in resolution bandwidth is used in combination with a decrease in video bandwidth to resolve two signals of equal amplitude with a frequency separation of 100 kHz.

Notice that the final RBW selection to resolve the signals is the same width as the signal separation while the VBW is slightly narrower than the RBW.

- 1 Connect two sources to the analyzer input as shown below.

**Figure 3 Setup for obtaining two signals**



- 2 Set one source to 300 MHz. Set the frequency of the other source to 300.1 MHz. Set both source amplitudes to -20 dBm.
- 3 Setup the analyzer to view the signals:
  - Press **[PRESET]**.
  - Press **[FREQ] > {Center Freq} > 300 > {MHz}**.
  - Press **[BW/SWP] > {RBW} > 300 > {kHz}**.
  - Press **[SPAN] > {Span} > 2 > {MHz}**.



If the signal peak is not present on the screen, span out to 20 MHz, set the center frequency to the first marker frequency, span back to 2 MHz:

- Press **[SPAN] > {Span} > 20 > {MHz}**.
- Press **[MARKER] > {Peak Search} > {Peak}**.
- Press **[MARKER] > {Marker To} > {To Center}**
- Press **[SPAN] > {Span} > 2 > {MHz}**.

4 Change the resolution bandwidth (RBW) to 100 kHz so that the RBW setting is less than or equal to the frequency separation of the two signals:

- Press **[BW/SWP] > {RBW} > 100 > kHz**.

Notice that the peak of the signal has become flattened indicating that two signals are present.

5 Decrease the video bandwidth to 10 kHz:

- Press **[BW/SWP] > {VBW} > 10 > kHz**.

Use the knob or the arrow keys to further reduce the resolution bandwidth and better resolve the signals.

As the resolution bandwidth is decreased, resolution of the individual signals is improved and the sweep time is increased. For fastest measurement times, use the widest possible resolution bandwidth. Under factory preset conditions, the resolution bandwidth is coupled to the span.

## Resolving Small Signals Hidden by Large Signals

This example uses narrow resolution bandwidths to resolve two input signals with a frequency separation of 50 kHz and an amplitude difference of 60 dB.

- 1 Connect two sources to the analyzer input connector as shown in [Figure 3](#) on page 46.
- 2 Set one source to 300 MHz at -10 dBm. Set the other source to 300.05 MHz at -70 dBm.
- 3 Set the analyzer as follows:
  - Press **[PRESET]**
  - Press **[FREQ] > {Center Freq} > 300 > {MHz}**
  - Press **[BW/SWP] > {RBW} > 30 > {kHz}**
  - Press **[SPAN] > [500] > kHz.**

If the signal peak is not present on the display, span out to 20 MHz, set the first marker frequency to center frequency, span back to 2 MHz.

- Press **[SPAN] > 20 > {MHz}**
  - Press **[MARKER] > {Peak Search}**
  - Press **[MARKER] > {Marker To} > {To Center}**
  - Press **[SPAN] > 2 > {MHz}**
- 4 Set the 300 MHz signal to the reference level:
    - Press **[MARKER] > {Peak Search}**
    - Press **[MARKER] > {Peak Search} > {To Ref}**
  - 5 Reduce the resolution bandwidth filter to view the smaller hidden signal. Place a delta marker on the smaller signal:
    - Press **[BW/SWP] > {RBW} > 1 > {kHz}**
    - Press **[MARKER] > {Peak Search}**
    - Press **[MARKER] > {Delta}**
    - Press **[BW/SWP] > {RBW} > 50 > {kHz}**

## Measuring a Low-Level Signal

This section provides information on measuring low-level signals and distinguishing them from spectrum noise. There are four main useful techniques as follows to measure a low-level signal.

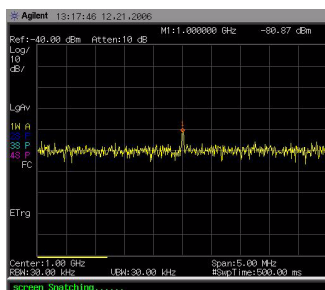
### Reducing Input Attenuation

The ability to measure a low-level signal is limited by internally generated noise in the spectrum analyzer.

The input attenuator affects the level of a signal passing through the analyzer. If a signal is very close to the noise floor, reducing input attenuation will bring the signal out of the noise.

- 1 Preset the analyzer:
- 2 Input a signal (1 GHz, -80 dBm) to the analyzer RF input connector.
- 3 Set the center frequency, span and reference level:
  - Press **[FREQ] > {Center Freq} > 1 > {GHz}**
  - Press **[SPAN] > 5 > {MHz}**
  - Press **[AMPTD] > {Ref Level} > 40 > {-dBm}**
- 4 Move the desired peak (in this example, 1 GHz) to the center of the display:
  - Press **[MARKER] > {Peak Search}**
  - Press **[MARKER] > {Marker To} > {To Center}**

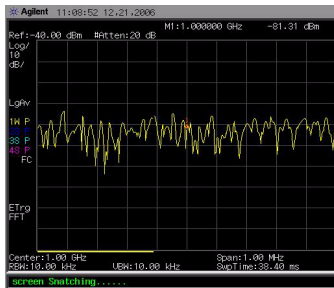
**Figure 4 A signal closer to the noise level (Atten:10 dB)**



## 4 Making Measurements

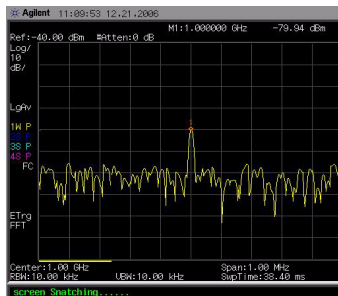
- 5 Reduce the span to 1 MHz and if necessary re-center the peak.
  - Press **[SPAN] > [1] > {MHz}**.
- 6 Set the attenuation to 20 dB. Note that increasing the attenuation moves the noise floor closer to the signal level.
  - Press **[AMPTD] > {Attenuation} > 20 > {dB}**.

**Figure 5 A signal closer to the noise level (Atten:20 dB)**



- 7 Press **[AMPTD] > Attenuation > 0 > {dB}** to set the attenuation to 0 dB.

**Figure 6 A signal closer to the noise level (Atten: 0 dB)**



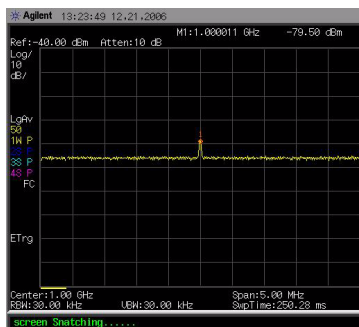
## Decreasing the Resolution Bandwidth

Resolution bandwidth settings affect the level of internal noise without affecting the level of continuous wave (CW) signals. Decreasing the RBW by a decade reduces the noise floor by 10 dB.

- 1 Refer to “Reducing Input Attenuation” on page 49, and follow steps 1, 2 and 3.
- 2 Decrease the resolution bandwidth:
  - Press **[BW/SWP] > {RBW}**, and toggle RBW setting to **Man (manual)**, then decrease the resolution bandwidth using the knob, the arrow keys or the numeric keypad.

The low level signal appears more clearly because the noise level is reduced.

**Figure 7 Decreasing Resolution Bandwidth**

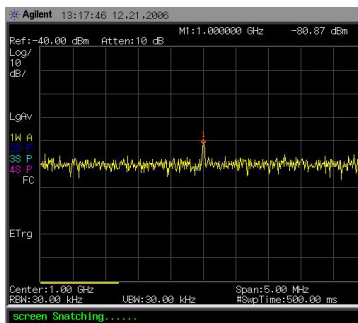


### Using the Average Detector and Increased Sweep Time

When the analyzer's noise masks low-level signals, changing to the average detector and increasing the sweep time smooths the noise and improves the signal's visibility. Slower sweeps are required to average more noise variations.

- 1 Refer to ["Reducing Input Attenuation"](#) on page 49, and follow steps 1, 2 and 3.
- 2 Press **[TRACE] > {More (1 of 2)} > {Detector} > {Average}** to select the average detector.
- 3 Press **[BW/SWP] > {Sweep Time}** to set the sweep time to 500 ms.  
Note how the noise smooths out, as there is more time to average the values for each of the displayed data points.
- 4 Press **[BW/SWP] > {Avg Type}** to change the average type.

**Figure 8 Using the Average Detector**



## Trace Averaging

Averaging is a digital process in which each trace point is averaged with the previous average for the same trace point.

Selecting averaging, when the analyzer is auto coupled, changes the detection mode to sample, smoothing the displayed noise level.

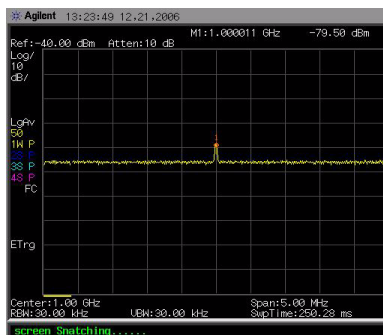
### NOTE

This is a trace processing function and is not the same as using the average detector (as described on [page 52](#)).

- 1 Refer to the first procedure “[Reducing Input Attenuation](#)” on page 49, and follow steps 1, 2 and 3.
- 2 Press [TRACE] > {Average} (On) to turn average on.
- 3 Press 50 > [ENTER] to set the average number to 50.

As the averaging routine smooths the trace, low level signals become more visible.

**Figure 9 Trace Averaging**



### Improving Frequency Resolution and Accuracy

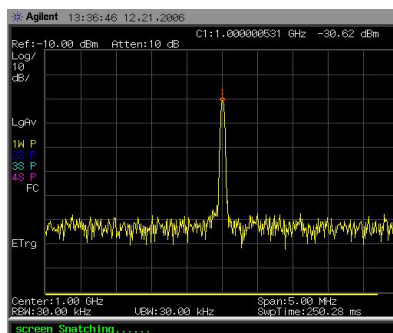
Using the frequency counter to improve frequency resolution and accuracy.

#### NOTE

Marker count properly functions only on CW signals or discrete spectral components. The marker must be > 40 dB above the displayed noise level.

- 1 Press **[PRESET]**. (Factory Preset)
- 2 Input a signal (1 GHz, -30 dBm) to the analyzer's **RF IN** connector.
- 3 Set the center frequency to 1 GHz and the span to 5 MHz:
- 4 Press **[MARKER] > {More (1 of 2)} > {Mode} > {Freq Count}** to turn the frequency counter on.
- 5 Move the marker by rotating the knob, half-way down the skirt of the signal response.
- 6 Press **[MARKER] > {More (1 of 2)} > {Mode} > {Normal}** to turn off the marker counter.

**Figure 10 Using Frequency Counter**





## Making Distortion Measurements

This section provides information on measuring and identifying signal distortion.

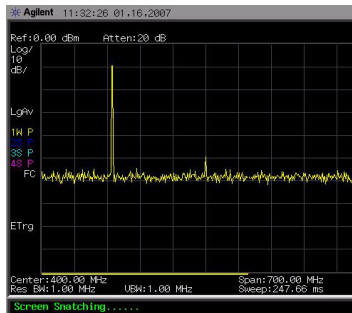
### Identifying Analyzer Generated Distortion

High level input signals may cause analyzer distortion products that could mask the real distortion measured on the input signal. Use trace and the RF attenuator to determine which signals, if any, are internally generated distortion products. In this example, use a signal from a signal generator to determine whether the harmonic distortion products are generated by the analyzer.

- 1 Input a signal (200 MHz, -10 dBm) to the analyzer **RF IN** connector.
- 2 Set the analyzer center frequency and span:
  - Press **[PRESET]**. (Factory Preset)
  - Press **[FREQ] > {Center Freq} > 400 > {MHz}**.
  - Press **[SPAN] > 700 > {MHz}**.

The signal produces harmonic distortion products (spaced 200 MHz from the original 200 MHz signal)

**Figure 11 Harmonic Distortion**

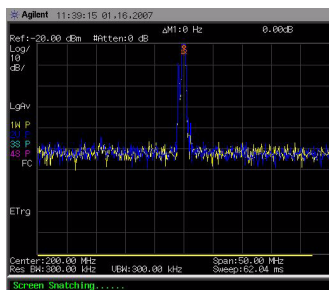
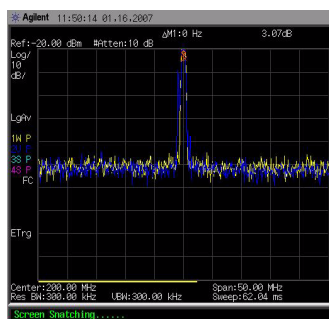


## 4 Making Measurements

- 3 Change the center frequency to the value of the first harmonic:
  - Press **[MARKER] > {Peak Search}**.
  - Press **[MARKER] > {Marker To} > {To Center}**.
- 4 Change the span to 50 MHz and re-center the signal:
  - Press **[SPAN] > 50 > {MHz}**.
  - Press **[MARKER] > {Peak Search}**.
  - Press **[MARKER] > {Marker To} > {To Center}**.
- 5 Set the attenuation to 0 dB:
  - Press **[AMPTD] > {Attenuation} > 0 > {dB}**.
  - Press **[MARKER] > {Marker To} > {To Ref}**.
- 6 To determine whether the harmonic distortion products are generated by the analyzer, first save the trace data in trace 2 as follows:
  - Press **[TRACE] > {Trace (2)}**.
  - Press **[TRACE] > {Clear Write}**.
- 7 Allow trace 2 to update (minimum two sweeps), then store the data from trace 2 and place a delta marker on the harmonic of trace 2:
  - Press **[TRACE] > {View}**.
  - Press **[MARKER] > {Peak Search}**.
  - Press **[Marker] > {Delta}**.

Please refer to [Figure 12](#), the screen shows the stored data in trace 2 and the measured data in trace 1. The Marker indicator reads the difference in amplitude between the reference and active markers.

- 8 Press **[AMPTD] > {Attenuation} > 10 > {dB}** to increase the RF attenuation to 10 dB.

**Figure 12 Identifying Analyzer Distortion (0 dB atten)****Figure 13 Identifying Analyzer Distortion (10 dB atten)**

The marker amplitude readout comes from two sources:

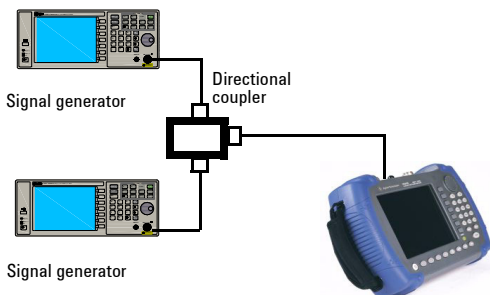
- Increased input attenuation causes poorer signal-to-noise ratio. This causes the marker to be positive.
- The reduced contribution of the analyzer circuits to the harmonic measurement causes the Marker to be negative.

Large marker readout indicates significant measurement errors. Set the input attenuator to minimize the absolute value of marker.

### Third-Order Intermodulation Distortion

Two-tone, third-order intermodulation distortion is a common test in communication systems. When two signals are present in a non-linear system, they may interact and create third-order intermodulation distortion (TOI) products that are located close to the original signals. These distortion products are generated by system components such as amplifiers and mixers. This example tests a device for third-order intermodulation using markers. Two sources are used, one set to 300 MHz and the other to 301 MHz.

- 1 Connect the equipment as shown in figure below.



This combination of signal generators, low pass filters, and directional coupler (used as a combiner) results in a two-tone source with very low intermodulation distortion.

Although the distortion from this setup may be better than the specified performance of the analyzer, it is useful for determining the TOI performance of the source/analyzer combination. After the performance of the source/analyzer combination has been verified, the DUT (Device Under Test, for example, an amplifier) would be inserted between the directional coupler output

and the analyzer input.

**NOTE**

The coupler should have a high degree of isolation between the two input ports so the sources do not intermodulate.

- 2 Set one source (signal generator) to 300 MHz and the other source to 301 MHz, for a frequency separation of 1 MHz. Set the sources equal in amplitude as measured by the analyzer (in this example, they are set to -5 dBm).
- 3 Set the analyzer center frequency and span:
  - Press **[PRESET]**. (With Preset Type of Default)
  - Press **[FREQ] > {Center Freq} > 300.5 > {MHz}**.
  - Press **[SPAN] > 5 > {MHz}**.
- 4 Reduce the RBW until the distortion products are visible:
  - Press **[BW/SWP] > {RBW}**, and reduce the RBW using the knob, the arrow keys or the numeric keypad.
- 5 Move the signal to the reference level:
  - Press **[MARKER] > {Peak Search}**.
  - Press **[MARKER] > {Marker To} > {To Ref}**.
- 6 Reduce the RBW until the distortion products are visible:
  - Press **[BW/SWP] > {RBW}**, and reduce the RBW using the knob, the arrow keys or the numeric keypad.
- 7 Activate the second marker and place it on the peak of the distortion product (beside the test signal) using the Next Peak:
  - Press **[MARKER] > {Delta}**.
  - Press **[MARKER] > {Peak Search} > {Next Left (Right) PK}**.
- 8 Measure the other distortion product:
  - Press **[MARKER] > {Normal}**.

## 4 Making Measurements

- Press [**MARKER**] > {**Peak Search**} > {**Next Left (Right) Peak**}.

9 Measure the difference between this test signal and the second distortion product.

- Press [**Marker**] > {**Normal**}.
- Press [**MARKER**] > {**Peak Search**} > {**Next Left (Right) Peak**}.

## Measuring Phase Noise

Phase Noise is a frequency domain measure of stability. We specify phase noise as single sideband power in relation to the fundamental RF output frequency, and measured at various offset frequencies from the carrier, normalized to a one hertz measuring bandwidth.

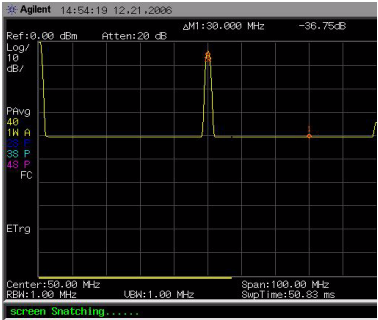
- 1 Press **[PRESET]**.
- 2 Input a signal (50 MHz, 0 dBm) to the analyzer **RF IN** connector.
- 3 Set the center frequency, span:
  - Press **[FREQ] > {Center Freq} > 50 > {MHz}**.
  - Press **[SPAN] > 100 > {MHz}**.
- 4 Set the average mode to RMS
  - Press **[BW/SWP] > {Avg Type} > {Power}**
  - Press **[TRACE] > {More (1 of 2)} > {Detection} (Man) > {Average} (RMS)**
- 5 Turn on a marker and place it on the peak of the signal.
  - Press **[MARKER]** to active Marker 1
  - Press **[MARKER] > {Peak Search}**
- 6 Set the frequency offset for you to measure the Phase noise.
  - Press **[MARKER] > {Delta}**, then set the frequency of the delta marker to 30 MHz
- 7 Average the trace.
  - Press **[TRACE] > {More (1 of 2)} > {Average} (On)** and set the average number to 40 using the numeric keypad.

The value of marker delta displays in the upper right corner of the display. Then you can calculate the value of the phase noise by

$$Phrasenoise = a - \log RBW$$

## 4 Making Measurements

Figure 14 Measuring Phase Noise (1)



N9340A also provides an easy-to-use access for you to measure phase noise simply by pressing **[MARKER] > {More (1 of 2)} > {Mode} > {Noise}**, and then using the knob, the arrow keys or the numeric keypad placing the specified marker of interest.

Figure 15 Measuring Phase Noise (2)





## One Button Measurement

N9340A provides one-button measurement functionality on OBW (Occupied Band Width), channel power and ACPR (Adjacent Channel Power Ratio) and SEM (Spectrum Emission Mask) as an easy-to-use access for your measurement of interest.

### Measuring OBW

Occupied Bandwidth (OBW) integrates the power of the spectrum in the displayed green frame. The measurement defaults to 99% of the occupied bandwidth power.

The occupied bandwidth measurement can be made in single or continuous sweep mode.

#### Selecting a Method

Press **[MEAS] > {OBW} > {Method}** to toggle the occupied bandwidth measurement mode between **percentage (%)** and **dBc**.

- **Setting Percentage (%)**

Press **{OBW} > {Method} > {Percent}** to edit the percentage of signal power used when determining the occupied bandwidth. Press **{%}** to set the percentage ranging from 10.00% to 99.99%.

- **Setting dBc**

Press **{OBW} > {Method} > {dBc}** to specify the power level used to determine the emission bandwidth as the number of dB down from the highest signal peak, within the occupied bandwidth span. This function is an independent calculation from the OBW calculation. The x dB Bandwidth result is also called the emissions bandwidth (EBW). This will set green frame

(f1 and f2 are the two cross points of the signal and the pair of vertical lines of the displayed green frame) to your specified dB value below the maximum power and compute the total power in the frame. The emission bandwidth is then calculated ranging from 0.1 dB to 100 dB (the default value is set to 26 dB).

### Measuring ACPR

The adjacent channel power ratio (ACPR) measures the power ratio between the main channel power and the adjacent channel power.

#### Center Frequency

Sets the center frequency of the main channel power.

Key Access: **[MEAS] > {ACPR} > {Center Freq}**

#### Main Channel

Specifies the range of integration used in calculating the power in the main channel. Use the knob, the arrow keys or the numeric keypad to set the bandwidth.

Key Access: **[MEAS] > {ACPR} > {Main Channel}**

#### Adjacent Channel

Specifies the range of integration used in calculating the power in the adjacent channel. Use the knob, the arrow keys or the numeric keypad to set the bandwidth.

Key Access: **[MEAS] > {ACPR} > {Adj Channel}**

#### Channel Space

Sets the space value between the center frequency of main channel power and that of the adjacent channel power.

Key Access: **[MEAS] > {ACPR} > {Channel Space}**

## Measuring Channel Power

Measures the power and power spectral density in the channel bandwidth that you specified. One pair of vertical lines of the displayed green frame indicates the edges of the channel bandwidth. The center frequency, reference level, and channel bandwidth must be set by the user.

The power calculation method used to determine the channel power is a traditional method known as the integration bandwidth (IBW) method. A swept spectrum is used as the basis for this calculation. Therefore, it is important to set the resolution bandwidth correctly before making this measurement using the following formula:

$$RBW = k \times \frac{Span}{n}$$

Where k is a value between 1.2 and 4.0 and n is the number of trace points.

### Center Frequency

Sets the center frequency of the display.

Key Access: [MEAS] > {Channel Power} > {Center Freq}

### Integration Bandwidth

Specifies the bandwidth of integration bandwidth which ranges from 100 Hz to 3 GHz to calculate the power in a channel. For example, set the main (center) channel bandwidth. Note that the green frame indicates the integration bandwidth. You are allowed to change integration bandwidth using the knob, the arrow keys or the numeric keypad.

Key Access: [MEAS] > {Channel Power} > {Int BW}

### Channel Bandwidth

Sets the analyzer span for the channel power measurement using the knob, the arrow keys or the numeric keypad. Be sure the span is set between 1 and 10 times the integration bandwidth.

Key Access: **[MEAS] > {Channel Power}**



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## 5 Key Reference



# Amplitude

Activates the reference level function and access the associated softkeys to set functions that affect the way data on the vertical axis is displayed or corrected.

## Ref level

Activates the reference level function.

The reference level is the amplitude power or voltage represented by the top graticule on the display. Changing the value of the reference level changes the absolute amplitude level (in the selected amplitude units) of the top graticule line. The reference level can be changed using the arrow keys, the knob, or the numeric keypad. Pressing any digit (0 through 9) on the numeric keypad brings up the terminator menu.

Key Access: [AMPTD]

## Attenuation

Toggles the input attenuation between **Auto** or **Man**.

The input attenuation ranges from 1dB to 51 dB and allows you to set the attenuation level in 1 dB increments when Attenuation is set to **Man**.

The input attenuator, normally coupled to the reference level control, reduces the power level of the analyzer input signal at the input mixer. The attenuator is recoupled when Attenuation is set to **Auto**.

### CAUTION

To prevent damage to the input mixer, do not exceed a power level of +33 dBm at the input. A granted power level for stable sensitive measurement is less than 20 dBm.

---

Key Access: [AMPTD]

## Preamp

Toggles the internal preamp between **On** and **Off**.

Preamp results in a correction being applied to compensate for the gain of the preamp at 20 dBm so that amplitude readings show the value at the input connector.

### NOTE

When the preamp is on, a PA indication appears on the left side of the display.

---

The preamp is set on in frequency bands from 1 MHz to 3 GHz, otherwise the correction is not applied even though the **PA** indication will still appear.

Key Access: **[AMPTD]**

## Scale/DIV

Sets the logarithmic units per vertical graticule division on the display.

### NOTE

The Scale/Div function is only available when the Scale Type key is set to **Log**.

---

Key Access: **[AMPTD]**

## Scale Type

Toggles the scale type of vertical graticule divisions between logarithmic and linear.

When scale type sets to **Log**, a Logarithmic units is activated ranging from 1 to 10 dB per division.

When Scale Type sets to **Lin**, the vertical divisions are linearly scaled and the default amplitude units are volts. The top of the display is set to the reference-level value and the bottom graticule becomes zero volts. (Each division of the tragically is one-tenth of the reference level in volts.)

Key Access: **[AMPTD] > {Scale Type}**

### Ref Offset

Adds an offset value which ranges from -327.6 dB to +327.6 dB to the displayed reference level.

#### NOTE

Reference-level offsets are only entered by using the numeric keypad. Entering an offset does not affect the trace or the attenuation value.

---

Reference-level offsets are used when gain or loss occurs between a device under test and the analyzer input. Thus, the signal level measured by the analyzer may be referred to as the level at the input of an external amplitude-conversion device. When an amplitude offset is entered, its value appears in the lower left corner of the display.

Key Access: **[AMPTD]**

### Y Axis Units

Sets the amplitude units.

#### NOTE

Amplitude units are maintained for both logarithmic and linear modes depending on the Scale Type setting.

---

Key Access: **[AMPTD] > {Y Axis Units}**



## BW/SWP

Activates bandwidth function and accesses the associated softkeys to control resolution bandwidth, video bandwidth and sweep time.

### RBW

Changes the 3 dB resolution bandwidth on the analyzer from 30 Hz to 1 MHz in a 1, 3, 10 sequence using the knob, step keys or the numeric keypad.

**NOTE**

When an unavailable bandwidth entered using the numeric keypad, the closest available bandwidth in the 1, 3, 10 sequence is used.

---

As the resolution bandwidth is decreased, the sweep time is modified to maintain the amplitude calibration. Resolution bandwidth is also related to span. As span is decreased, the resolution bandwidth is decreased. As the resolution bandwidth changes, the video bandwidth, if in auto couple mode, changes to maintain the VBW/RBW ratio.

**NOTE**

When RBW is set to Auto in non-zero span, any changes to RBW while in zero span will revert to the Auto value when you return to non-zero span. When **RBW** is set to Man in non-zero span, any changes to RBW while in zero span will be maintained when you return to non-zero span.

---

A “#”mark appears next to RBW on the display when it is not coupled.

Key Access: **[BW/SWP]**

### VBW

Changes the analyzer post-detector filter from 3 Hz to 1 MHz in a 1, 3, 10 sequence using the knob, the step keys, or the numeric keypad.

#### NOTE

When an unavailable bandwidth entered using the numeric keypad, the closest available bandwidth in the 1, 3, 10 sequence is used.

---

As the video bandwidth is decreased, the sweep time is increased to maintain amplitude calibration.

A “#”mark appears next to RBW on the display when it is not coupled.

Key Access: **[BW/SWP]**

### VBW/RBW

Selects the ratio between the video and resolution bandwidths.

If signal responses near the noise level are visually masked by the noise, the ratio can be set to less than 1 to lower the noise. The knob and step keys change the ratio in a 1, 3, 10 sequence.

#### NOTE

When preset is set to default, or VBW/RBW is set to Auto, the ratio is set to 1.

---

Key Access: **[BW/SWP]**

### Avg Type

Accesses the functions to automatically or manually choose from one of the following averaging type:

## Log Pwr

Averages the data as appropriate for the logarithmic scaled y-axis.

When average type is set to **Log Pwr**, “LgAv” appears on the left side of the display.

Key Access: [BW/SWP] > {Avg Type}

## Pwr

Performs by converting the trace data from logarithmic to linear power units, and then averaging the power trace data.

When average type is set to **Pwr**, “PAvg” appears on the left side of the display.

Key Access: [BW/SWP] > {Avg Type}

## Voltage

Averages the data as appropriate for the linearly scaled y-axis scale.

When average type is set to **Voltage**, “VAvg” appears on the left side of the display.

Key Access: [BW/SWP] > {Avg Type}

There are actually four types of averaging processes within a N9340A. All, except VBW filtering, are affected by this setting. They are listed as follows:

- **Trace averaging**

Averages signal amplitudes on a trace-to-trace basis. (Press **Log Pwr** or **Pwr**)

- **Average detector**

Averages signal amplitudes during the time or frequency interval represented by a particular measurement point.

- **Noise marker**

Averages signal amplitudes across measurement points to reduce variations for noisy signals.

- **VBW filtering**

Performs a form for averaging the video signal.

### Sweep Time

Selects the length of time the analyzer takes to tune across the displayed frequency span (or, in zero span, the time the analyzer takes to sweep the full screen) using the knob, the arrow keys, or numeric keypad.

#### NOTE

Reducing the sweep time increases the sweep rate.

Key Access: **[BW/SWP]**

#### In non-zero spans:

When the sweep time is auto-coupled, the analyzer selects the optimum (shortest) sweep time ranging from 10 ms to 1000 s for the current settings. This selection process is influenced by three factors:

- Frequency Span
- The selected Resolution Bandwidth
- The selected Video Bandwidth

Note that changing one of the three factors above occurs the change of sweep time. The sweep time is in direct ratio to frequency span and in reverse ratio to the selected resolution bandwidth and video bandwidth when auto-coupled.

#### CAUTION

When the sweep time is set to a value less than the minimum auto-coupled value, an annotation "Data out of range" appears in the active function block and the sweep time is automatically converted to the minimum auto-coupled value.

#### In zero span:

The auto-coupled status is invalid in zero span. You are only allowed to set the sweep time manually. The sweep time ranges from 6  $\mu$ s to 200 s in zero span.

## In FFT Mode

In FFT mode, the sweep time is auto-coupled as default. And the submenu of sweep time is invalid in FFT mode.

## Sweep

Activates the sweep mode function and accesses the the associated softkeys to set functions that affect the way trace sweep on the display.

### Sweep

Toggles the analyzer between the continuous-sweep mode and the single-sweep mode.

- **Sweep (Single)**

Puts the analyzer in a single-sweep mode. In a single-sweep mode, pressing [BW/SWP] > {**Single Sweep**} enables a sweep.

Key Access: [BW/SWP] > {**Sweep**}

- **Sweep (Cont)**

Performs one sweep following another as soon as it is triggered. Pressing [Preset] (When Preset Type is set to Default) or turning the power on, sets the sweep mode to continuous sweep as default.

Key Access: [BW/SWP] > {**Sweep**}

### Sweep Mode

A N9340A provides two sweep modes to meet different sweep time requirements:

- **Normal**

Activates the sweep mode as default.

Key Access: [BW/SWP] > {**Sweep**} > {**Sweep Mode**}

- **Fast**

Activates the fast sweep mode.

Fast sweep mode provides a fast measurement function which decreases the sweep time, but this mode brings a decrease of amplitude accurate.

Key Access: **[BW/SWP] > {Sweep} > {Sweep Mode}**

### Single Sweep

When analyzer is in continuous sweep mode and not in a measurement (**[MEAS] > Measure Off**), Pressing **[BW/SWP] > {Single Sweep}** convert the continuous sweep to single sweep and executes a sweep after the trigger condition is met. If the analyzer is already in single sweep, pressing **[BW/SWP] > {Single Sweep}** executes a new sweep after the trigger condition is met.

If Average is on (**[TRACE] > {More (1 of 2)} > {Average} > On**), pressing **[BW/SWP] > {Single Sweep}** halts the average on the current average number, and continue the average from the current count number as soon as the single sweep function triggers.

Key Access: **[BW/SWP] > {Sweep}**

## Enter

- Terminates and enters into the analyzer a numerical value that has been entered from the front panel using the numeric keypad. (For most applications, it is better to use the associated softkeys.)
- Terminate filename entries.

## ESC/CLR

Provides mainly two types of functions as follows:

### Clear

- Clears any numeric entry and cancels the active function.
- Clears any title entry and cause the title to revert to the previous name.
- Clears input or output overloads
- Clears error messages from the status line along the bottom of the display.

### Associate with other functions

Provides a permitted setting for triggering other functions as follows:

- Activates **LIMIT** function for pass/fail judgement.
- Activates **SAVE** function for current trace saving.

#### CAUTION

When pressing [ESC/CLR], a current parameter annotation in the lower left corner disappears which is an indicator of available setting of **LIMIT** and **SAVE**.

---



## Frequency

Activates the center frequency function, and accesses the menu of frequency functions. The center frequency, or start and stop frequency values appear below the graticule on the display.

**NOTE**

When changing both the center frequency and the span, change the frequency first since the span can be limited by the frequency value.

---

### Center Frequency

Activates the center frequency function which allows you to set the horizontal center of the display to a specified frequency.

Key Access: **[FREQ]**

### Start Frequency

Sets the frequency at the left side of the graticule. The left and right sides of the graticule correspond to the start and stop frequencies. When these frequencies are activated, their values are displayed below the graticule in place of center frequency and span.

Key Access: **[FREQ]**

### Stop Frequency

Sets the frequency at the right side of the graticule. The left and right sides of the graticule correspond to the start and stop frequencies. When these frequencies are activated, their values are displayed below the graticule in place of center frequency and span.

Key Access: **[FREQ]**

## CF Step

Changes the step size for the center frequency function. Once a step size has been selected and the center frequency function is activated, the arrow keys change center frequency by the step-size value. The step size function is useful for finding harmonics and sidebands beyond the current frequency span of the analyzer. When auto-coupled, the center size is set to one division (10 percent of the span).

Key Access: **[FREQ]**

## Marker

Accesses the marker control softkeys to select the type and number of markers. Markers are diamond-shaped characters that identify points of traces. Up to six pairs of markers may appear on the display simultaneously; only one pair can be controlled at a time. The marker that is controlled is called the “active” marker. Pressing **[MARKER]** activates the Normal menu key.

### Marker

Selects one of the six possible markers. A marker that has already been selected will become active when it is turned on. If a marker has been turned on and assigned to a specific trace, it will become active on that trace if that marker is selected.

Key Access: **[MARKER]**

### Normal

Activates a single frequency marker at the center of the active trace if a marker is not already displayed. If a marker is displayed before the **Normal** function is enabled, the marker is enabled at the position of the selected marker. The marker number is indicated above the marker. The knob and/or arrow keys move the marker left or right. If a value is entered from the numeric keypad, the marker is moved to the trace point nearest to that value. Annotation in the active function block and in the upper right corner indicates the frequency and amplitude of the marker (time and amplitude, if in zero span.) Pressing **Normal** turns off the **Delta** function and moves the active marker to the delta marker position.

Key Access: **[MARKER]**

### Delta

Activates a second marker at the position of the first marker. (If no marker is present, two markers appear at the center of the display). The amplitude and frequency (or time) of the first marker is fixed. The marker number is indicated above the delta marker, and the same number is indicated with an R (for example, 1R) above the reference marker. Use the data controls to position the delta marker. Annotation in the active function block and in the upper-right corner of the display indicates the frequency (or time) and amplitude differences between the two markers. The markers will be turned off if the scale type is changed between log and linear.

#### NOTE

Press **Delta** again moves the reference marker to the active marker position, so you are allowed to make delta measurements from differing reference points without having to turn off the makers and begin again.

#### NOTE

The delta marker function permits signal-to-noise measurements provided the signal is a single spectral component (sinusoid). Place a normal marker on the signal, press Delta, place the delta marker in the noise, and activate Marker Noise. The indicated amplitude differences signal-to-noise/Hz.

Key Access: **[MARKER]**

### Off

Turns off the active function markers.

Key Access: **[MARKER]**

## Peak Search

Place a marker on the highest peak based on the setting of the Search Criteria as follows:

- **Peak**

Place a marker on the highest peak.

Key Access: [MARKER]

- **Next LF Peak**

Moves the marker to the next peak to the left of the current marker. The signal peak must exceed the peak threshold value by the peak excursion value. If there is no peak to the right, the marker will not move and the **No Peak Found** error message will appear on the display.

Key Access: [MARKER]

- **Next RT Peak**

Moves the marker to the next peak to the right of the current marker. The signal peak must exceed the peak threshold value by the peak excursion value. If there is no peak to the right, the marker will not move and the **No Peak Found** error message will appear on the display.

Key Access: [MARKER]

- **Auto Search**

In non-zero span, pressing **Auto Search** turns the six markers all on and put them on the six highest peak in the current frequency span.

In zero span, the function is not available.

Key Access: [MARKER]

## Marker To

Access the following marker function menu keys:

- **To Center**

Sets the center frequency of the analyzer to the marker frequency. In Delta mode, pressing [**Marker**] > {**Marker To**} > {**To Center**} sets the center frequency to the marker delta value. The function is not available in zero span.

**NOTE**

When the frequency scale is in log mode, the center frequency is not at the center of the display.

---

Key Access: [**MARKER**] > {**To Center**}

- **To Ref**

Changes the reference level to the active marker value, moving the marked point to the reference level (top line of the graticule). In Delta mode, pressing [**Marker**] > {**Marker To**} > {**To Ref**} sets the reference level to the amplitude difference between the markers.

Key Access: [**MARKER**] > {**Marker To**}

## Mode

Accesses the following menu keys that allows you to change the active marker readout mode.

- **Normal**

Active the default readout mode.

- **Freq Count**

Activates a frequency counter mode.

**NOTE**

Frequency counter properly only on CW signals or discrete peaks. For a valid reading, the marker must be >25 dB above the noise.

**Freq Count** function is not supported under **Marker Delta** condition.

---

## • Noise

Active a noise readout mode for evaluating power density.

### NOTE

**Noise** mode is properly only on noise peaks and not supported under **Marker Delta** condition.

Key Access: [MARKER] > {More (1 of 2)} > {Mode}

## Marker Trace

Activates a marker on the trace if there are no markers turned on. If a marker is currently active, press Marker Trace until 1, 2, 3, or 4 is underlined. The active marker will be moved to the selected trace.

Selecting **Auto** will move the marker to the automatically selected trace. The selection order is to look for the lowest numbered trace in the following order of trace modes:

---

<b>Clear write</b>	<b>Max hold</b>
<b>Min hold</b>	<b>View</b>

If there is no trace in any of these modes, it selects trace 1 as default.

Key Access: [MARKER] > {Marker Trace}

## All Off

Turns off all of the markers, including markers used for signal track and demodulation. Marker annotation is also removed.

Key Access: [MARKER] > {All Off}

### Meas

In the spectrum analysis mode (see “Mode” on page 84 [MODE](#)), Pressing **[Meas]** brings up a menu of power suite for measurements such as adjacent channel power, occupied bandwidth, channel power, spectrum emission mask and TOI. Refer to “[One Button Measurement](#)” on page 63 for more information about these measurements. Press Measure Off to turn the power measurement off.



## Span

Activates the span function and accesses the submenu of span functions. Pressing **[SPAN]** allows you to change the frequency range symmetrically about the center frequency. The frequency-span readout describes the total displayed frequency range. To determine frequency span per horizontal graticule division (when the frequency scale type is set to linear), divide the frequency span by 10.

### Span

Allows you to enter a span frequency range value.

Key Access: **[SPAN]**

### Full

Changes the span to full span showing the full frequency range of the analyzer.

Key Access: **[SPAN]**

### Zero

Changes the frequency span to zero. In this mode, the current center frequency is displayed in the time domain (the x-axis is displayed in units of time), like a conventional oscilloscope.

Key Access: **[SPAN]**

### Last Span

Changes the span to the previous span setting.

Key Access: **[SPAN]**

## TRACE

Accesses the trace keys to store and manipulate trace information. Each trace is comprised of a series of data points in which amplitude information is stored. The analyzer updates the information for any active trace with each sweep.

If you have selected **Channel Power**, **OBW**, or **ACPR** in the **MEAS** menu, refer to “[One Button Measurement](#)” on page 63.

### Trace

Selects the trace for current use.

Key Access: **[TRACE]**

#### CAUTION

When using normalization, the mode of traces 2, 3, and 4 should not be changed.

---

### Clear Write

Erases any data previously stored in the selected trace and continuously displays any signals during the sweep of the analyzer. This function is activated for trace 1 at power-on and Factory **Preset**.

Key Access: **[TRACE]**

### Max Hold

Maintains the maximum level for each trace point of the selected trace, and updates each trace point if a new maximum level is detected in successive sweeps.

#### NOTE

Changing the vertical scale (**Amplitude**, **Scale Type**, **Log or Line**), or pressing **PRESET**, or turning averaging on (**TRACE**, **Average (On)**) or switching widow in Zone Span restarts the held trace.

---

Key Access: **[TRACE]**

## Minimum Hold

Maintains the minimum level for each trace point of the selected trace, and updates each trace point if a new minimum level is detected in successive sweeps.

### NOTE

Changing the vertical scale (**Amplitude, Scale Type, Log or Line**), or pressing **PRESET**, or turning averaging on (**TRACE, Average (On)**) or switching widow in Zone Span restarts the held trace.

---

Key Access: **[TRACE]**

## View

Holds and displays the amplitude data of the selected trace. The trace register is not updated as the analyzer sweeps. If a trace is deactivated by pressing Blank, the stored trace data can be retrieved by pressing View.

Key Access: **[TRACE]**

## Blank

Stores the amplitude data for the selected trace and removes it from the display. The selected trace register will not be updated as the analyzer sweeps. This function is activated for traces 2, 3 and 4 at power-on and Factory Preset.

Key Access: **[TRACE]**

## Detector

Selects a specific detector, or uses the system to pick the appropriate detector for a particular measurement.

When discussing detectors, it is important to understand the concept of a trace “bucket”. For every trace point displayed, there is a finite time during which the data for that point is collected. The analyzer has the ability to look at all of the

data controlled during that time and present a single point of trace data based on the detector mode. We call the interval during which the data for that trace point is being collected, the “bucket”. Thus a trace is more than a series of single points. It is actually a series of trace “buckets”. The data may be sampled many times within each bucket.

When the detector sets to **Auto**, Pressing **[TRACE] > {More (1 of 2)} > {Average}** and select **On** changes the detector. The Auto choice depends on marker functions, trace functions, and the trace averaging function. If a marker function or measurement is running, the Auto choice of detector is either Average or Sample. When one of the detectors (such as Average) is manually selected instead of Auto, that detector is used without regard to other analyzer settings.

- **Auto**

Selects peak detector as the default. If a measurement condition arises where a different type of detector scheme would be better utilized, the system will use the alternate scheme.

Key Access: **[TRACE] > {More (1 of 2)} > {Detector}**

- **Normal**

Selects the maximum and minimum video signal values alternately. When selecting Normal detector, “N” appears in the upper-left corner.

Key Access: **[TRACE] > {More (1 of 2)} > {Detector}**

- **Average**

Measures the average value of the amplitude across each trace interval (bucket). When Average is selected, “A” appears on the left corner.

Key Access: **[TRACE] > {More (1 of 2)} > {Detector}**

- **Pos Peak**

Obtains the maximum video signal between the last display point and the present display point and stores this value in memory. It's used primarily

when measuring sinusoidal (spectral) components. When Positive Peak is selected, “P” appears in the upper-left corner.

Key Access: [TRACE] > {More (1 of 2)} > {Detector}

#### • Sample

Primarily used to display noise or noise-like signals. It should not be used to measure the accurate amplitude of non noise-like signals. In sample mode, the instantaneous signal value at the present display point is placed in memory. When Sample detector is selected, “S” appears in the upper-left corner of the display.

Key Access: [TRACE] > {More (1 of 2)} > {Detector}

#### • Neg Peak

Provides functions the same as peak detector, but selects the minimum video signal value. This detector should not be used to measure the most accurate amplitude. When Negative Peak is selected, “N” also appears in the upper-left corner.

Key Access: [TRACE] > {More (1 of 2)} > {Detector}

## Average

Initiates a digital averaging routine that averages the trace points in a number of successive sweeps resulting in trace “smoothing”. Increasing the average number will further smooth the trace. For the information of the type of averaging please refer to “Avg Type” on page 72.

The average is restarted when any of the following occurs:

- a new average number is entered.
- any related parameter (e.g., center frequency) is changed.

Press **Average (Off)** to turn off averaging.

The number of sweeps can only be set using the numeric keypad, not the knob or arrow keys.

Key Access: [TRACE] > {More (1 of 2)} > {Average}

## Save Trace

Saves a current trace into a file (\*.DAT).

The instrument adds an integer in 1, 2, 3 sequence at the rear of the previous saved filename as the current saved filename.

If there is no record of saved trace, the default file name of the current saved trace is "HYTRACE.DAT".

Key Access: **[TRACE] > {More (1 of 2)} > {Save trace}**

## Save As

Saves a current trace in a file with a user-defined filename.

You are allowed to enter the filename using the numeric keypad and using **[ENTER]** as a terminator.

Numbers, Letters and Underline are all the available components of a filename.

Key Access: **[TRACE] > {More (1 of 2)} > {Save as}**

## Recall Trace

Recalls a saved trace as the current activated trace.

Key Access: **[TRACE] > {More (1 of 2)} > {Recall trace}**

## Limit

### Limit Line

Activates an adjustable horizontal line that is used as a visual reference line.

The line, which can be used for trace arithmetic, has amplitude values that correspond to its vertical position when compared to the reference level. The value of the display line appears in the active function block and on the left side of the display. Use the arrow keys, knob, or numeric keypad to adjust the display line. Pressing any digit, 0 through 9, on the numeric keypad brings up the selected terminator menu. To deactivate the display line, press **Display Line (Off)**.

Key Access: [**Limit**]

### Limit Pattern

Turns on the limit pattern function and turns off the limit line function simultaneously.

Key Access: [**Limit**]

### Set Pattern

Allows you to set a limit pattern for measurements.

You can create or edit limit points up to 4 points to define the limit line.

Pressing **X Axis Unite** to toggle the frequency domain or time domain before you set the parameter of limit point.

Key Access: [**Limit**]

### Limit Type

Defines the limit you are editing as either an upper or lower limit. An upper limit fails if trace 1 exceeds the limit. A lower limit fails if trace 1 falls below the limit.

Key Access: [**Limit**]

### Beep

Sounds alarm as an indicator of limit fails.

Key Access: **[Limit]**

### Save Pattern

Save the parameters of the current limit pattern in a file (\*.PTN).

You are allowed to enter the filename using the numeric keypad and using **[ENTER]** as a terminator.

Number, Letter and Underline are all the available composition of a filename.

Key Access: **[Limit]**

### Recall Pattern

Recall the parameters of the saved limit pattern.

Key Access: **[Limit]**





Agilent N9340A  
Handheld Spectrum Analyzer  
User's Guide

## 6 SCPI Command Reference



## SCPI Language Basics

SCPI is an ASCII-based instrument command language designed for test and measurement instruments, with the goal of reducing automatic test equipment (ATE) program development time.

SCPI accomplishes this goal by providing a consistent programming environment for instrument control and data usage. This consistent programming environment is achieved by the use of defined program messages, instrument responses, and data formats across all SCPI instruments.

By providing a consistent programming environment, replacing one SCPI instrument with another SCPI instrument in a system will usually require less effort than with non-SCPI instrument.

SCPI is not a standard which completely provides for interchangeable instrumentation. SCPI helps move toward interchangeability by defining instrument commands and responses, but not functionality, accuracy, resolution, etc.

### Common Terms used in this Book

Terms	Description
Controller:	Any computer used to communicate with an instrument. A controller can be a personal computer (PC), a minicomputer, or a plug-in card in a card cage. Some intelligent instruments can also function as controllers.
Instrument:	Any device that implements SCPI. Most instruments are electronic measurement or stimulus devices, but this is not a requirement. Similarly, most instruments use a GPIB or RS-232 or USB interface for communication. The same concepts apply regardless of the instrument function or the type of interface used.
Command:	An instruction. You combine commands to form messages that control instruments to complete a specified task. In general, a command consists of mnemonics (keywords), parameters and punctuation.
Query:	A special type of command. Queries instruct the instrument to make response data available to the controller. Query keywords always end with a question mark (?).

## Basic Knowledge Requirement

Programming with SCPI requires knowledge of:

- Computer programming languages, such as C or C++.
- The language of your instrument. A N9340A employs SCPI as its programming language.

## Command Categories

The SCPI command falls into two categories:

- Subsystem commands
- Common commands

Use a computer to control the signal generator (but operate the line power switch manually). Computer programming procedures for the spectrum analyzer involve selecting a programming statement and then adding the specified programming codes to that statement to achieve the desired operating conditions.

## Command Syntax

Command syntax includes standard notations and statement rules.

### Command Statement Rules Overview

- Command statements read from left to right
- Use either long form or short form of keywords, but do not use both
- No separating space between the keywords, only use a colon to separate keywords of different levels
- Always separating a keyword from a variable with a space
- Always separating a variable from its unit with a space (if variable has a unit)

## Standard Notations

A command consists of mnemonics (keywords), parameters and punctuation. Before you start to program your analyzer, familiarize yourself with the standard notation of each of them.

### Keywords

Many commands have both a long and a short form: use either one. (a combination of the two is not allowed). Consider the `:FREQUENCY` command for example:

- Short form : `FREQ`
- Long form : `FREQUENCY`

SCPI is not case sensitive, so `fREquEncy` is just as valid as `FREQUENCY`, but `FREQ` and `FREQUENCY` are the only valid forms of the `FREQUENCY` command.

In this documentation, upper case letters indicate the short form of the keyword. The upper case and lower case letters indicate the long form of the keyword.

### Punctuation

- A vertical bar "|" dictates a choice of one element from a list. For example: `<A>|<B>` indicates that either A or B can be selected, but not both.
- Square brackets "[ ]" indicates that the enclosed items are optional.
- Angle brackets "< >" indicates a variable value to be defined.
- A question mark "?" after a command indicates that this command is a query. The instrument should return a data to the controller.
- A curly brackets "{ }" indicates a variable parameters to be defined.

**Separator**

- A colon “:” separates keywords of different levels.
- A space separates a keyword and a parameter, as well as a parameter and a unit.

# Common Commands

These commands are specified in IEEE Standard 488.2-1992, *IEEE Standard Codes, Formats, Protocols and Common Commands for Use with ANSI/IEEE Std 488.1-1987*. New York, NY, 1992.

## Clear Status

\*CLS

This command clears the status byte. It does this by emptying the error queue and clearing all bits in all of the event registers.

## Identification Query

\*IDN?

This command returns an instrument identification information string. The response is organized into four fields by commas. The field definitions are as follows:

- Manufacturer
- Model
- Serial number
- Firmware version

## Reset

\*RST

This command returns the instrument to a factory defined condition that is appropriate for remote programming operation.

## CALCulate Subsystem

This subsystem is used to perform post-acquisition data processing. In effect, the collection of new data triggers the CALCulate subsystem. This subsystem is further divided into two subsections: limits and markers which are the primary functions in this subsystem.

### CALCulate:LLINE Subsection

A N9340A allows you to define a limit line for your measurement. You can then have the instrument compare the data to your defined limit and indicate a pass/fail condition.

#### NOTE

Refer to : TRACe subsystem for more trace commands.

#### Delete All Limit Lines in Memory

```
:CALCulate:LLINE:ALL:DELeTe
```

This command deletes all limit lines in volatile memory.

---

Key Access:	[Limit] > {Limit Mode}
-------------	------------------------

---

#### Select the Type of Limit Line

```
:CALCulate:LLINE[1]:TYPE UPPER|LOWer
:CALCulate:LLINE[1]:TYPE?
```

This command sets a limit line to be either an upper or lower type. An upper line will be used as the maximum allowable value when comparing with the data. A lower limit line defends the minimum value.

---

*RST State:	Upper
Range:	Upper Lower
Key Access:	[Limit] > {Limit Mode}

---

**Control Limit line Buzzer**

```
:CALCulate:LLINE[1]:BUZZer[:STATe]
```

```
OFF|ON|0|1
```

```
:CALCulate:LLINE[1]:BUZZer[:STATe]?
```

This command toggles the audio warning between on and off. If data exceeds the limit line the buzzer will sound an alarm.

---

\*RST State: Off

Key Access: [Limit] > {Beep}

---

**Control Limit Line Testing**

```
:CALCulate:LLINE[1]:[STATe] OFF|ON|0|1
```

```
:CALCulate:LLINE[1]:[STATe]?
```

This command toggles the limit line testing between on and off.

If the limit line is turned on, limit pattern is automatically turned off.

---

\*RST State: Off

Key Access: [Limit] > {Limit Line}

---

**Set Limit Line Y-axis value**

```
:CALCulate:LLINE[1]:Y <value>
```

```
:CALCulate:LLINE[1]:Y?
```

This command sets limit line Y-axis value.

Limit line Y-axis value is set independently without affected by the X-axis Units.

---

\*RST Value: 0 dBm

Available Unit: dBm, -dBm, mV, uV

Key Access: [Limit] > {Limit Line}

---



## Control Limit Pattern Testing

```
:CALCulate:LLINE[1]:PATTERN[:STATE]
OFF|ON|0|1
```

```
:CALCulate:LLINE[1]:PATTERN[:STATE]?
```

This command toggles the limit pattern testing between on and off.

If the limit pattern is turned on, limit line is automatically turned off.

---

*RST State:	Off
Key Access:	[Limit] > {Limit Pattern}

---

## Set Limit Pattern X-axis Units

```
:CALCulate:LLINE[1]:PATTERN:DOMain
FREQ|TIME
```

```
:CALCulate:LLINE[1]:PATTERN:DOMain?
```

This command selects how the limit pattern points are defined: according to frequency, or according to the sweep time setting of the spectrum analyzer. The query command returns a string of FREQ or TIME.

---

*RST State:	Frequency
Range:	FREQ TIME
Key Access:	[Limit] > {Set pattern} > {X axis unit}

---

**Define Limit Pattern Values**

```
:CALCulate:LLINE[1]:DATA
<x-axis>,<ampl>{,<x-axis>,<ampl>}
:CALCulate:LLINE[1]:DATA?
```

This command defines limit pattern values, and destroys all existing data. A N9340A allows you to set as many as four points to compose the limit pattern by connecting them together.

---

\*RST State: Off

Key Access: [Limit] > {Set Pattern}

---

- <x-axis> – are values in frequency or time domain as specified by  
:CALCulate:LLINE[1]:PATtern:DOMain.

---

Domain	Valid Unit
Frequency	Hz, kHz, MHz, GHz
Time	us, ms, s, ks

---

- <ampl> – amplitude values are in the current Y-axis units. A N9340A provides you four choices for Y-axis units: uV, mV, -dBm, dBm.

## CALCulate:MARKer Subsection

### Markers All Off on All Traces

```
:CALCulate:MARKer:AOff
```

This command turns off all markers on all the traces.

---

Key Access:	[Marker] > {More} > {All Off}
-------------	-------------------------------

---

### Markers All On

```
:CALCulate:MARKer:ALL
```

This command turns on all the markers and places them on six highest peaks.

---

*RST State:	Off
Key Access:	[Marker] > {Peak search} > {Auto search}

---

### Frequency Counter Marker

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6 :FCOUNT  
[:STATe] OFF | ON | 0 | 1
```

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6 :FCOUNT  
[:STATe] ?
```

This command turns on or off the marker frequency counter. To query the frequency counter, use

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6 :FRECount  
:X? If the specified marker number is not on, it  
will be turned on and becomes the active marker  
(normal mode). Once the marker count is on, it is  
on for any active marker, not just for the one used
```

in the command. A 1 is returned only if marker count is on and the selected number is the active marker.

---

Remarks:	If a frequency count x value is generated when the frequency count state is off, then 9e15 is return.
*RST State:	Off
Key Access:	[Marker] > {More} > {Freq Count}

---

## Marker Function

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6:FUNCTION  
FCOUNT | NOISE | OFF
```

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6:FUNCTION?
```

This command selects the marker function for the specified marker.

FCOUNT is a frequency counter function.

NOISE is a noise measurement.

OFF turns off all functions.

---

Key Access	[Marker] > {More (1 of 2)} > {Mode}
------------	-------------------------------------

---

## Marker Peak (Maximum) Search

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6:MAXimum
```

This command performs a peak search based on the search mode settings.

---

Key Access	[Marker] > {Peak search} > {Peak}
------------	-----------------------------------

---

### Marker Peak (Maximum) Left Search

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6 :  
MAXimum:LEFT
```

This command places the selected marker on the next highest signal peak to the left of the current marked peak.

---

Key Access	[Marker] > {Peak search} > {Next Left PK}
------------	---

---

### Marker Peak (Maximum) Right Search

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6 :  
MAXimum:RIGHT
```

This command places the selected marker on the next highest signal peak to the right of the current marked peak.

---

Key Access	[Marker] > {Peak search} > {Next Right PK}
------------	--

---

### Marker Mode

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6 :MODE  
POSITION|DELTA|OFF  
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6 :MODE?
```

This command sets the Markers to the following mode:

- **Position**  
Selects a normal marker that can be positioned on a trace and from which trace information will be generated.
- **Delta**  
Activates a pair of markers, one of which is fixed at the current marker location. The other marker can then be moved around on the trace. The marker readout shows the difference between the two markers.

- Off  
Turns marker off.

---

Key Access:            [Marker] > {Normal}  
                         [Marker] > {Delta}  
                         [Marker] > {Off}

---

### Set Center Frequency to the Marker Value

:CALCulate:MARKer  
[1] | 2 | 3 | 4 | 5 | 6 [:SET]:CENTer

This command sets the center frequency equal to the specified marker frequency, which moves the marker to the center of the screen. In delta marker mode, the center frequency is set to the marker delta value. This command is not available in zero span.

---

Key Access:            [Marker] > {Marker To} > {To Center}

---

### Set Reference Level to the Marker Value

:CALCulate:MARKer  
[1] | 2 | 3 | 4 | 5 | 6 [:SET]:RLEVel

This command sets the reference level to the specified marker amplitude. In delta marker mode, the reference level is set to the amplitude difference between the markers.

---

Key Access:            [Marker] > {Marker To} > {To Ref}

---

### Marker On/Off

:CALCulate:MARKer [1] | 2 | 3 | 4 | 5 | 6 :STATe  
OFF | ON | 0 | 1  
:CALCulate:MARKer [1] | 2 | 3 | 4 | 5 | 6 :STATe?

This command toggles the selected marker between on and off.

---

Key Access:            [Marker] > {Normal}  
                         [Marker] > {Off}

---

## Marker to Trace

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6:TRACe
<integer>
```

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6:TRACe?
```

This command assigns the specified marker to the designated trace 1, 2, 3 or 4.

---

*RST value:	1
Range:	1 to 4
Key Access:	[Marker] > {More} > {Marker Trace}

---

## Marker X Value

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6:X <param>
```

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6:X?
```

This command positions the designated marker on its assigned trace at the specified trace X value. The value is in the X-axis units (which is often frequency or time).

The query returns the current X value of the designated marker.

---

*RST State:	Matches the units of the trace on which the marker is positioned.
Key Access:	[Marker] > {Normal}

---

**Marker Read Y Value**

```
:CALCulate:MARKer[1] | 2 | 3 | 4 | 5 | 6 :Y?
```

This command reads the current Y value for the designated marker or delta on its assigned trace. The value is in the Y-axis units for the current trace (which is often dBm).

---

*RST State:	Matches the units of the trace on which the marker is positioned.
Remarks:	This command is used to read the results of marker functions such as band power and noise that are displayed in the marker value field on the analyzer.

---



## DEMOdulation Subsystem

This sub tree commands are used to control the demodulation after the measure has been loaded by [ :SENSe ] :FREQuency:SPAN:ZERO

### AM Demodulation

```
:DEMod:AM:STATe OFF|ON|0|1
```

```
:DEMod:AM:STATe?
```

This command toggles AM demodulation function between off and on.

---

*RST State:	Off
Key Access:	[Span] > {Demode} > {AM (On)}

---

### FM Demodulation

```
:DEMod:FM:STATe OFF|ON|0|1
```

```
:DEMod:FM:STATe?
```

This command toggles FM demodulation function between off and on.

---

*RST State:	Off
Key Access:	[Span] > {Demode} > {FM (On)}

---

## DISPlay Subsystem

The DISPlay subsystem controls the selection and presentation of textual, graphical, and trace information. Within a display, information may be separated into individual windows.

### Turn the Entire Display On/Off

```
:DISPlay:ENABLe OFF|ON|0|1
```

This command turns the display on or off. Having the display turned off may increase repetitive measurement rate.

---

*RST State:	On
-------------	----

---

### Trace Y-Axis Scaling

```
:DISPlay:WINDow:TRACe:Y[:SCALe]
:PDIVision 1|2|5|10
:DISPlay:WINDow:TRACe:Y[:SCALe]
:PDIVision?
```

This command sets the per-division display scaling for the y-axis when y-axis units are set to amplitude units.

---

*RST Value:	10 dB
Range:	1 dB, 2 dB, 5 dB or 10 dB
Key Access:	[AMPTD] > {Scale/DIV}

---

## Trace Y-Axis Reference Level

```
:DISPlay:WINDow:TRACe:Y[:SCALE]:RLEVel
<ampl>
```

```
:DISPlay:WINDow:TRACe:Y[:SCALE]:RLEVel?
```

This command sets the amplitude value of the reference level for the y-axis.

---

*RST Value:	0.00 dBm
Range:	-100.00 to +30 dBm
Default Unit:	Current active units
Key Access:	[AMPTD] > {Ref Level}

---

## Trace Y-Axis Reference Level Offset

```
:DISPlay:WINDow:TRACe:Y[:SCALE]:RLEVel:
OFFSet<rel_ampl>
```

```
:DISPlay:WINDow:TRACe:Y[:SCALE]:RLEVel:
OFFSet?
```

This command sets the amplitude level offset for the Y-Axis.

---

*RST Value:	0.00 dB
Range:	-327.60 dB to +327.60 dB
Default Unit:	dB
Key Access:	[AMPTD] > {Ref Offset}

---

## Vertical Axis Scaling

```
:DISPlay:WINDow:TRACe:Y[:SCALe]:SPACing
LINear|LOGarithmic
```

```
:DISPlay:WINDow:TRACe:Y[:SCALe]:SPACing?
```

Specifies the vertical graticule divisions as log or linear units.

---

*RST State:	Logarithmic
Key Access:	[AMPTD] > {Scale Type}

---

## Screen Color Style

```
:DISPlay:COLor GRAY|PINK|GREen|BLUE
```

```
:DISPlay:COLor?
```

This command sets the screen color style of interest.

---

*RST State:	Gray
Range:	Gray Pink Green Blue
Key Access:	[SYS] > {Setting} > {General} > {Color Mode}

---

## Display Mode

```
:DISPlay:MODE DARK|BRIGHT
```

```
:DISPlay:MODE?
```

This command sets the screen brightness and contrast mode according to the lighting condition.

---

*RST State:	Dark
Key Access:	[SYS] > {Display}

---

## Contrast

```
:DISPlay:MODE:CONTRast<integer>
```

```
:DISPlay:MODE:CONTRast?
```

This command adjusts the contrast of the current screen display.

---

*RST Value:	55
Range:	0 to 100
Key Access:	[SYS] > {Contrast}

---

## Brightness

```
:DISPlay:MODE:BRIGHtness <integer>
```

```
:DISPlay:MODE:BRIGHtness?
```

This command adjusts the brightness of the current screen display.

---

*RST Value:	45
Range:	0 to 100
Key Access:	[SYS] > {Brightness}

---

## INITiate Subsystem

The INITiate subsystem is used to control the initiation of the trigger. Refer to the TRIGger subsystem for related commands.

### Continuous or Single Measurements

```
:INITiate:CONTInuous OFF|ON|0|1
```

```
:INITiate:CONTInuous?
```

Selects whether the trigger system is continuously initiated or not.

This command affects sweep if not in a measurement, and affects trigger when in a measurement. A “measurement” refers to any of the functions under the **MEAS** key. This corresponds to continuous sweep or single sweep operation when not in a measurement, and continuous measurement or single measurement operation when in a measurement.

When not in a measurement, this command does the following:

- When **ON** at the completion of each sweep cycle, the sweep system immediately initiates another sweep cycle.
- When **OFF**, the sweep system remains in an “idle” state until CONTInuous is set to **ON** or an :INITiate[:IMMediate] command is received. On receiving the :INITiate[:IMMediate] command, it will go through a single sweep cycle, and then return to the “idle” state.
- The query returns 1 or 0 into the output buffer. 1 is returned when there is continuous sweeping. 0 is returned when there is only a single sweep.

When in a measurement, this command does the following:

- When **ON** at the completion of each trigger cycle, the trigger system immediately initiates another trigger cycle.
- When **OFF**, the trigger system remains in an “idle” state until CONTinuous is set to **ON** or an :INITiate[:IMMediate] command is received. On receiving the :INITiate[:IMMediate] command, it will go through a single trigger cycle, and then return to the “idle” state.
- The query returns 1 or 0 into the output buffer. 1 is returned when in a continuous measurement state. 0 is returned when there is only a single measurement.

---

*RST State:	Continuous, or On
Key Access:	[BW/SWP] > {Sweep}

---

## Take New Data Acquisitions

:INITiate[:IMMediate]

This command initiates a sweep if not in a measurement. If in a measurement, it triggers the measurement. A “measurement” refers to any function under the **MEAS** key.

Note that the function is enable only when the continuous is **OFF**.

---

Key Access:	[BW/SWP] > {Single Sweep}
-------------	---------------------------

---

## INSTRument Subsystem

This subsystem includes commands for querying and selecting instrument measurement (personality option) mode.

### Select One button measurement

```
:INSTRument:MEASure OFF|CHPower|ACPR|OBW
```

```
:INSTRument:MEASure?
```

Selects the one button measurement among channel pow, adjacent channel power ratio and occupied bandwidth.

---

*RST State:	Off
-------------	-----

Key Access:	[MEAS]
-------------	--------

---



## MEASure Subsystem

Provides programming information for the keys associated with the measurements available when you press the front-panel Measure key.

### OBW Subsection

#### Setting Percentage (%) method of OBW

```
:MEASure:OBW:PERCent <value>
```

```
:MEASure:OBW:PERCent?
```

edit the percentage of signal power used when determining the occupied bandwidth. Press {**%**} to set the percentage ranging from 10.00% to 99.99%.

#### Setting dBc method of OBW

```
:MEASure:OBW:XDB <value>
```

```
:MEASure:OBW:XDB?
```

specify the power level used to determine the emission bandwidth as the number of dB down from the highest signal point, within the occupied bandwidth span.

### ACPR Subsection

#### Center Freq

```
:MEASure:ACPR:CENTer <value>
```

```
:MEASure:ACPR:CENTer?
```

Sets the center frequency of the main channel power.

### Main channel

```
:MEASure:ACPR:MAIN <value>
```

```
:MEASure:ACPR:MAIN?
```

Specifies the range of integration used in calculating the power in the main channel. Use the knob and the arrow keys to set the bandwidth.

### Adjacent channel

```
:MEASure:ACPR:ADJacent <value>
```

```
:MEASure:ACPR:ADJacent?
```

Specifies the range of integration used in calculating the power in the adjacent channel. Use the knob and the arrow keys to set the bandwidth.

### Channel space

```
:MEASure:ACPR:SPACE <value>
```

```
:MEASure:ACPR:SPACE?
```

Sets the space value between the center frequency of main channel power and that of the adjacent channel power.

There are also some remote commands which are irrelevant to the front-panel keys.

### **Main Channel Power**

Return the main channel power of ACPR measurement.

:MEASure:ACPR:MPower?

### **Low Adjacent Channel Power**

Return the lower adjacent channel power of ACPR measurement.

:MEASure:ACPR:LPower?

### **Upper Adjacent Channel Power**

Return the upper adjacent channel power of ACPR measurement.

:MEASure:ACPR:UPower?

### **Low Adjacent Channel Power Ratio**

Return the lower adjacent channel power to main channel power ratio.

:MEASure:ACPR:LRatio?

### **Upper Adjacent Channel Power Ratio**

Return the upper adjacent channel power to main channel power ratio.

:MEASure:ACPR:URatio?

## Channel Power Subsection

### Center Freq

```
:MEASure:CHPower:CENTer <value>
```

```
:MEASure:CHPower:CENTer?
```

Sets the center frequency of the display.

### Int BW

```
:MEASure:CHPower:IBW <value>
```

```
:MEASure:CHPower:IBW?
```

Specifies the bandwidth of integration which ranges from 100 Hz to 3 GHz to calculate the power in a channel.

### Channel Span

```
:MEASure:CHPower:SPAN <value>
```

```
:MEASure:CHPower:SPAN?
```

Sets the analyzer span for the channel power measurement. Be sure the span is set between 1 and 10 times the integration bandwidth.

There are also some remote commands which are irrelative to the front-panel keys.

### **Channel Power and Power Density**

returns channel power and power density.

:MEASure:CHPower?

### **Channel Power**

Returns channel power only.

:MEASure:CHPower:CHPower?

### **Power Density**

Returns power density only.

:MEASure:CHPower:DENSity?

## SENSe Subsystem

Sets the instrument parameters for the input signal measurements.

### [::SENSe]:AVERage Subsection

#### Average Type

```
[::SENSe]:AVERage:TYPE
LogPower | PwEr | VOLTage
```

```
[::SENSe]:AVERage:TYPE?
```

This command sets the average type to the following three types:

- Log Pwr
- Power
- Voltage

For more information about the three types of average above, please refer to [“Avg Type”](#) on page 72

---

*RST State:	Log Pwr
Range:	Log Pwr, Pwr, Voltage
Key Access:	[BW/SWP] > {Avg Type}

---

#### Clear the current Average

```
[::SENSe]:AVERage:TRACe 1|2|3|4|5|6:CLEAr
```

This command restarts the trace averaging function.

#### NOTE

Restart the trace at the beginning of a sweep to obtain valid average data. To do this remotely abort the sweep and initiate a single sweep.

### Turn Averaging On/Off

```
[ :SENSe] :AVERAge:TRACe
1 | 2 | 3 | 4 | 5 | 6 [ :STATe] OFF | ON | 0 | 1
```

```
[ :SENSe] :AVERAge:TRACe
1 | 2 | 3 | 4 | 5 | 6 [ :STATe] ?
```

This command toggles averaging between off and on. Averaging combines the value of successive measurements to average out measurement variations.

---

\*RST State: Off

Key Access: [TRACE] > {Average}

---

### Set the Average Count

```
[ :SENSe] :AVERAge:TRACe 1 | 2 | 3 | 4 | 5 | 6 :COUNT
<value>
```

```
[ :SENSe] :AVERAge:TRACe
1 | 2 | 3 | 4 | 5 | 6 :COUNT?
```

This command specifies the number of measurements that are combined.

---

\*RST Value: 100

Key Access: [TRACE] > {Average}

---

## [ :SENSe]:BANDwidth Subsection

### Resolution Bandwidth

```
[ :SENSe]:BANDwidth|BWIDth [:RESolution]
<freq>
```

```
[ :SENSe]:BANDwidth|BWIDth [:RESolution]?
```

This command specifies the resolution bandwidth.

---

*RST Value:	1 MHz
Range:	30 Hz to 1 MHz
Available Unit:	Hz, kHz, MHz, GHz
Key Access:	[BW/SWP] > {RBW}

---

### Resolution Bandwidth Automatic

```
[ :SENSe]:BANDwidth|BWIDth
[:RESolution]:Auto OFF|ON|0|1

[ :SENSe]:BANDwidth|BWIDth
[:RESolution]:Auto?
```

This command couples the resolution bandwidth to the frequency span. Auto-couple resolution bandwidth is not available in zero span..

---

*RST State:	On
Key Access:	[BW/SWP] > {RBW}

---

### Video Bandwidth

```
[ :SENSe]:BANDwidth|BWIDth:VIdEO <freq>
```

```
[ :SENSe]:BANDwidth|BWIDth:VIdEO?
```

This command specifies the video bandwidth.

---

*RST Value:	1 MHz
Range:	3 Hz to 1 MHz
Available unit:	Hz, kHz, MHz, GHz
Key Access:	[BW/SWP] > {VBW}

---



### Video Bandwidth Automatic

```
[ :SENSe]:BANDwidth|BWiDth:ViDeo:AUTO  
OFF|ON|0|1
```

```
[ :SENSe]:BANDwidth|BWiDth:ViDeo:AUTO?
```

This command couples the video bandwidth to the resolution bandwidth.

---

\*RST State: On

Key Access: [BW/SWP] > {VBW}

---

### Video to Resolution Bandwidth Ratio

```
[ :SENSe]:BANDwidth|BWiDth:ViDeo:RATio  
<number>
```

```
[ :SENSe]:BANDwidth|BWiDth:ViDeo:RATio?
```

This command specifies the ratio of the video bandwidth to the resolution bandwidth.

---

\*RST Value: 1.00

Range: 0.001 to 1000

Key Access: [BW/SWP] > {VBW/RBW}

---

### Video to Resolution Bandwidth Ratio Mode Select

```
[ :SENSe]:BANDwidth|BWiDth:ViDeo:RATio:  
AUTO OFF|ON|0|1
```

```
[ :SENSe]:BANDwidth|BWiDth:ViDeo:RATio:  
AUTO?
```

This command selects auto or manual mode for video bandwidth to resolution bandwidth ratio.

---

\*RST State: On

Key Access: [BW/SWP] > {VBW/RBW}

---

## [[:SENSe]:DETector Subsection

### Automatic Detection Type Selected

```
[[:SENSe]:DETector:TRACe [1]|2|3|4 AUTO  
OFF|ON|0|1
```

```
[[:SENSe]:DETector:TRACe [1]|2|3|4 AUTO?
```

This command switches automatically to the optimum detection type for typical measurements using the current instrument settings.

The detector type is average if any of these are on:

- Noise marker
- Band power markers
- Trace averaging when the Average Type is Power (RMS).

The detector type is sample if any of the following conditions are true:

- Trace averaging is on with average type of video
- Both max and min hold trace modes are on
- Resolution bandwidth is less than 1 kHz, and noise marker, band power markers, or trace averaging is on.

The detector type is negative peak if any trace is in minimum hold and no traces are in max hold.

The detector type is peak if the above conditions are off.

Manually changing the detector function turns Auto off.

---

\*RST State:            On

Key

Access:                    [TRACE] > {More (1 of 2)} > {Detector}

---

## Types of Detection

```
[[:SENSe]:DETECTOR:TRACE [1] | 2 | 3 | 4
[FUNCTION]
AVERAge | POSitive | SAMPlE | NEGAtive | NORMAl
[:SENSe]:DETECTOR:TRACE [1] | 2 | 3 | 4
[FUNCTION]?
```

This command specifies the detection mode. For each trace interval (bucket), average detection displays the average of all the samples within the interval. The averaging can be done using two methods:

- The power method (RMS)
- The video method (Y Axis Units)

The method is controlled by the TRACE, Detector.

## [[:SENSe]:FREQUENCY Subsection

### Center Frequency

```
[[:SENSe]:FREQUENCY:CENTer <freq>
[:SENSe]:FREQUENCY:CENTer UP | DOWN
[:SENSe]:FREQUENCY:CENTer?
```

This command sets the center frequency.

---

*RST Value:	1.5 GHz
Available unit:	Hz, kHz, MHz, GHz
Key Access:	[FREQ] > {Center Freq}

---

**Center Frequency Step Size Automatic**

```
[ :SENSe] :FREQuency:CENTer:STEP:AUTO
OFF | ON | 0 | 1
[ :SENSe] :FREQuency:CENTer:STEP:AUTO?
```

This command specifies whether the step size is set automatically based on the span.

---

*RST State:	On
Key Access:	[FREQ] > {CF Step}

---

**Center Frequency Step Size**

```
[ :SENSe] :FREQuency:CENTer:STEP
[ INCRement] <freq>
[ :SENSe] :FREQuency:CENTer:STEP
[ INCRement] ?
```

This command specifies the center frequency step size.

---

*RST Value:	300 MHz
Available unit:	Hz, kHz, MHz, GHz
Key Access:	[FREQ] > {CF Step}

---

**Frequency Span**

```
[ :SENSe] :FREQuency:SPAN <freq>
[ :SENSe] :FREQuency:SPAN?
```

This sets the frequency span.

Setting the span to 0 Hz puts the analyzer into zero span.

---

*RST Value:	3.0 GHz
Available unit:	Hz, kHz, MHz, GHz
Key Access:	[SPAN] > {Span}

---

## Full Frequency Span

```
[ :SENSe] :FREQuency :SPAN :FULL
```

This command sets the frequency span to full scale.

---

\*RST Value: 3.0 GHz

Key Access: [SPAN] > {Full}

---

## Zero Frequency Span

```
[ :SENSe] :FREQuency :SPAN :ZERO
```

This command sets the frequency span to zero.

---

Key Access: [SPAN] > {Zero Span}

---

## Last Frequency Span

```
[ :SENSe] :FREQuency :SPAN :PREVIOUS
```

This command sets the frequency span to the previous span setting.

---

Key Access: [SPAN] > {Last Span}

---

## Start Frequency

```
[ :SENSe] :FREQuency :START <freq>
```

```
[ :SENSe] :FREQuency :START?
```

This command sets the start frequency.

---

\*RST Value: 0 Hz

Available Unit: Hz, kHz, MHz, GHz

Key Access: [SPAN] > {Start Freq}

---

**Stop Frequency**

```
[ :SENSe ] :FREQuency:STOP <freq>
```

```
[ :SENSe ] :FREQuency:STOP?
```

This command sets the stop frequency.

---

*RST Value:	3.0 GHz
Available unit:	Hz, kHz, MHz, GHz
Key Access:	[FREQ] > {Stop Freq}

---

## [ :SENSe]:POWer Subsection

### Input Attenuation

```
[ :SENSe]:POWer[:RF]:ATTenuation <value>
```

```
[ :SENSe]:POWer[:RF]:ATTenuation?
```

This command sets the value of the attenuator.

---

*RST Value:	20 dB
Range:	0 dB to 51 dB
Available unit:	dB
Key Access:	[AMPTD] > {Attenuation}

---

### Input Port Attenuator Auto

```
[ :SENSe]:POWer[:RF]:ATTenuation:AUTO  
OFF|ON|0|1
```

```
[ :SENSe]:POWer[:RF]:ATTenuation:AUTO?
```

This command selects the input port attenuator range to be set either automatically or manually.

On – Input attenuation is automatically set as determined by the Reference Level Setting.

Off – Input attenuation is manually set.

---

*RST State:	On
Key Access:	[AMPTD] > {Attenuation}

---

### Input Port Power Gain

```
[ :SENSe]:POWer[:RF]:GAIN[:STATe]  
OFF|ON|0|1
```

```
[ :SENSe]:POWer[:RF]:GAIN[:STATe]?
```

This command turns the internal preamplifier on or off.

---

*RST State:	Off
Key Access:	[AMPTD] > {Preamp}

---

## [ :SENSe]:SWEep Subsection

### Sweep Time

```
[ :SENSe]:SWEep:TIME <time>
```

```
[ :SENSe]:SWEep:TIME?
```

This command specifies the time in which the instrument sweeps the display.

---

*RST State:	1.076076 s
Range:	10 ms to 1000 s
Available unit:	ks, s, ms, us
Key Access:	[BW/SWP] > {Sweep Time}

---

### Automatic Sweep Time

```
[ :SENSe]:SWEep:TIME:AUTO OFF | ON | 0 | 1
```

```
[ :SENSe]:SWEep:TIME:AUTO?
```

This command automatically selects the fastest sweep time for the current settings.

---

*RST State:	On
Key Access:	[BW/SWP] > {Sweep Time}

---

### Sweep Time Mode

```
[ :SENSe]:SWEep:TIME:AUTO:MODE:  
SREsponse | SANalyzer
```

```
[ :SENSe]:SWEep:TIME:AUTO:MODE?
```

This command specifies the type of automatic coupling for the fastest sweep time at the current settings.

---

*RST State:	SANalyzer
Key Access:	[MODE]

---



## SYSTem Subsystem

This subsystem is used to set the controls and parameters associated with the overall system settings. These functions are not related to instrument performance.

### Ext Input

```
:SYSTem:CONFigure:PORT REF|TRIGger
```

#### :SYSTem:CONFigure:PORT?

This command toggles the channel for external input between **Ref** and **Trig**.

---

Key Access: [SYS] > {Setting} > {Ext input}

---

### Date Query

```
:SYSTem:DATE?
```

This query inquires the date of the real-time clock of the instrument.

### Time Query

```
:SYSTem:TIME?
```

This query inquires the time of the real-time clock of the instrument.

### Error Information Query

```
:SYSTem:ERRor[:NEXT]?
```

This query inquires the earlier entry to the error queue and then deletes that entry. .

---

Key Access: [SYS] > {Show Error}

---

## TRACe Subsystem

The TRACe subsystem controls access to the internal trace memory of the analyzer.

### Select Trace Display Mode

```
:TRACe 1|2|3|4:MODE
WRITE|MAXHole|MINHole|VIEW|BLANK
:TRACe 1|2|3|4:MODE?
```

This command selects the display mode as follows:

- **Write**  
Puts the trace in the normal mode, updating the data.
- **Maximum Hold**  
Displays the highest measured trace value for all the data that has been measured since the function was turned on.
- **View**  
Turns on the trace data so that it can be viewed on the display.
- **Blank**  
Turns off the trace data so that it is not viewed on the display.

---

*RST State:	Write
Key Access:	[TRACE] > {Clear Write}
	[TRACE] > {Max Hold}
	[TRACE] > {Min Hold}
	[TRACE] > {View}
	[TRACE] > {Blank}

---

#### NOTE

Whenever the number of sweep points change, the following functions affected:

- All trace data is erased
- Any traces in view mode will go to blank mode.

## TRIGer Subsystem

The TRIGer subsystem is used to set the controls and parameters associated with triggering the data acquisitions. Trigger subsystem is only valid when the analyzer is in zero span. Other trigger-related commands are found in the INITiate.

### External Trigger Slope

```
:TRIGer [:SEquence]:EXTernal:SLOPe
POSitive|NEGative
:TRIGer [:SEquence]:EXTernal:SLOPe?
```

This command activates the trigger condition that allows the next sweep to start when the external voltage passes through approximately 1.5 volts. The external trigger signal must be a TTL signal at 0 V to 5 V. This function only controls the trigger polarity (for positive or negative-going signals).

---

*RST State:	Positive
-------------	----------

---

### Trigger Source

```
:TRIGer [:SEquence]:SOURce
IMMediate|VIDeo|EXTernal
:TRIGer [:SEquence]:SOURce?
```

This command specifies the source (or type) of triggering used to start a measurement. Free-run activates the trigger condition that allows the next sweep to start immediately after the last sweep.

- Immediate is a free-run triggering
- Video triggers on the video signal level
- External allows you to connect an external trigger source.

---

*RST State:	Immediate (free-run triggering)
Key Access:	[Span] > {Trigger}

---

## Video Trigger Level Amplitude

```
:TRIGer [:SEquence]:VIDeo:LEVel <ampl>
```

```
:TRIGer [:SEquence]:VIDeo:LEVe?
```

This command specifies the level at which a video trigger will occur.

---

*RST Value:	0.00 dBm
-------------	----------

Key Access:	[Span] > {Trigger}
-------------	--------------------

---

## UNIT Subsystem

Select Power Units of Measure

:UNIT:POWer DBM|DBMV|DBUV|V|W

:UNIT:POWer?

This command specifies amplitude units for the input, output and display.

---

*RST Value:	dBm
-------------	-----

---





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## 7 Error Messages



## Error Message List

**NOTE**

A symbol [F] at the beginning of an error message indicates this is an error caused by manual front panel operation. A symbol [R] at the beginning of an error message indicates this is an error caused by remote control mode.

Error Code	Error Message	Description
0	No error	
-410	Query INTERRUPTED	Indicates that a condition causing an INTERRUPTED query occurred (see IEEE 488.2, 6.3.2.7)
-350	Query overflow	Indicates the SCPI remote interface error queue overflowed.
-321	Out of memory	Indicates an internal operation needed more memory than that was available.
-224	Illegal parameter value	Indicates you sent a parameter for this command that is NOT allowed.
-223	Too much data	Indicates a legal program data element of block, expression or string type was received that contained more data than the device could handle due to related device-specific requirements or memory.
-222	Data out of range	Indicates a legal data was parsed but could not be executed because of the interpreted value was outside the legal range defined by the analyzer. The displayed results may be clipped.



Error Code	Error Message	Description
-220	No matched module	Indicates no matched measurement or mode found.
-200	Execution error	This is a generic execution error for devices that cannot detect more specific errors. The code indicates on those execution errors defined in IEEE 488.2, 11.5.1.1.4 has occurred.
-171	Invalid expression	Indicates the data element was invalid, for example, unmatched parentheses, or an illegal character.
-144	Character data too long	Indicates the character data contained more than 12 characters. (see IEEE 488.2, 7.7.1.4)
764	Unable to save file	Indicates a failure occurred while saving a file. The file was not saved.
762	Unable to load file	Indicates a failure occurred while loading a file. The file was not loaded.
612	File NOT found	Indicates the analyzer could not find the specified file.
173	Lame package, please upgrade firmware	Indicates the current firmware is not mostly updated. The firmware needs upgrading.
172	Option install fail, invalid option licence	Indicates the option could not be installed, because of the invalid option licence.
171	File loaded	Indicates the file loading succeeded.
170	The menu is unavailable in this case	Indicates the memo is invalid in this case.
166	Marker counter opened in fast sweep	Indicates when the marker count is opened in fast sweep mode, the counter's accuracy decreases.

## 7 Error Messages

Error Code	Error Message	Description
162	Cannot open fast sweep in this case	Indicates current settings do not allow you to open fast sweep. For example, currently in FFT, zero span, or any measurement in power suite does not allow fast sweep.
159	Error 0x11, DSP will restart	Indicates DDC failed. If analyzer froze, try to restart the analyzer.
158	Error 0x10, DSP will restart	Indicates an internal error occurred, wait the analyzer to reboot. If analyzer froze, try to restart the analyzer.
157	Error 0xF	Indicates an error in internal communication.
156	Incorrect alignment file on flash	Indicates an invalid alignment file.
153	RF EEPROM operate fail	Indicates an error when writing alignment file.
152	Alignment file oversize	Indicates the alignment file has error or invalid data.
151	DSP boot fail	Indicates the analyzer cannot process measurement, wait the analyzer to reboot. If analyzer froze, try to restart the analyzer.
150	Mixer overload	Indicates the first mixer in danger. Either increase input attenuation or decrease the input signal level.
149	Mixer saturate	Indicates you need to either increase the input attenuation or decrease the input signal level.
148	Error 0xE	Indicates the analyzer reads unreasonable parameter value. If analyzer froze, try to restart the analyzer.

Error Code	Error Message	Description
147	Incorrect alignment data in EEPROM	Indicates invalid alignment data occurred.
143	Final IF overload	Indicates you need to either increase the input attenuation or decrease the input signal level.
138	USB device NOT ready	Indicates the USB device is not detected.
136	RBW limit to 30 kHz when in fast sweep	Indicates the analyzer automatically couple the RBW to 30 kHz when in fast sweep mode.
135	Error 0xB	Indicates the analyzer encounters a DLL file open failure. If analyzer froze, try to restart the analyzer.
134	Error 0xA	Indicates the analyzer failed at a dynamic loading process. If analyzer froze, try to restart the analyzer.
132	Error 0x8	Indicates some important files missing.
130	Meas uncal	Indicates the measurement is uncalibrated due to fast sweeping through a narrow RBW filter. Check the sweep time, span, and bandwidth settings, or use auto coupling.
119	RF Board Changed	Indicates the RF board was changed, the analyzer needs re-load the alignment data.
116	Cannot communicate with RF	Indicates the MCU cannot find the RF board.
112	Error 0x3, DSP will restart	Indicates an undefined error occurred when MCU tried to communicate with DSP. Wait the analyzer to reboot.

## 7 Error Messages

Error Code	Error Message	Description
111	Error 0x2, DSP will restart	Indicates an error occurred between MCU and DSP. Wait the analyzer to reboot.
110	Error 0x1, DSP will restart	Indicates a time out when waiting for DSP response. Wait the analyzer to reboot.



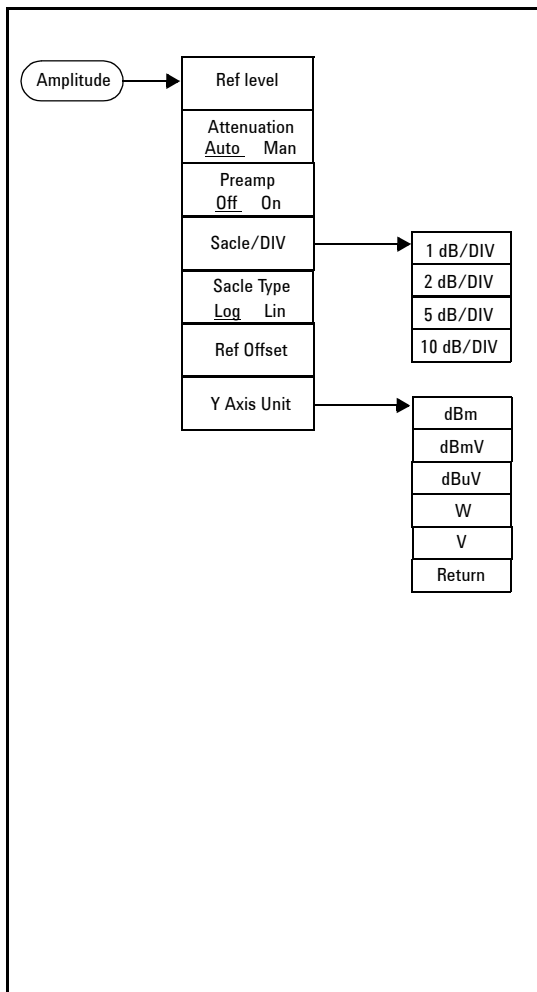
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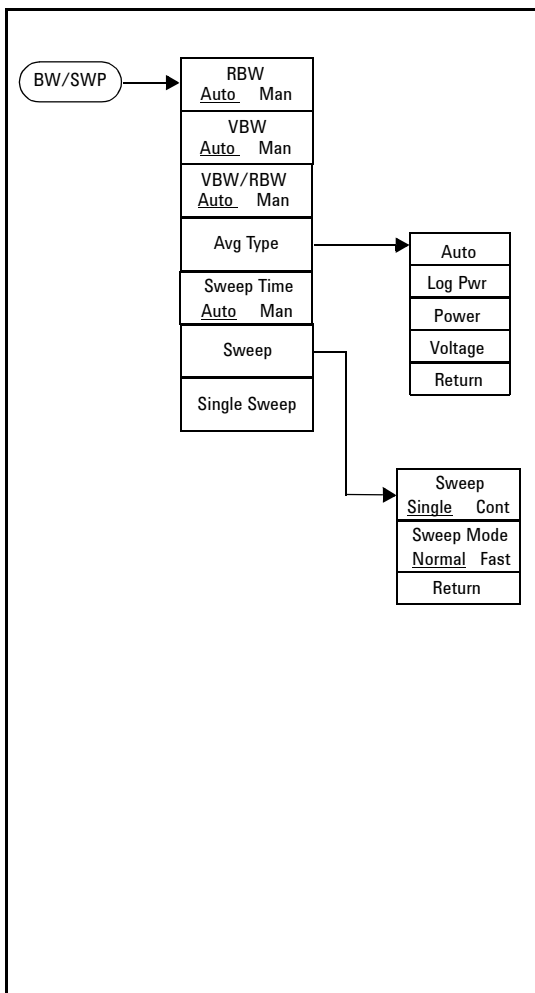
# Menu Map

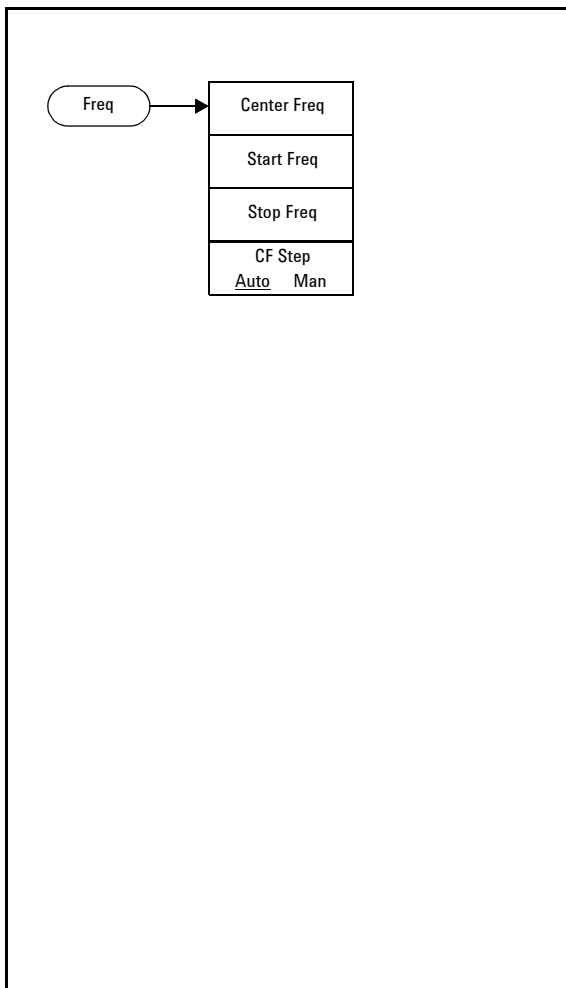


## AMPTD



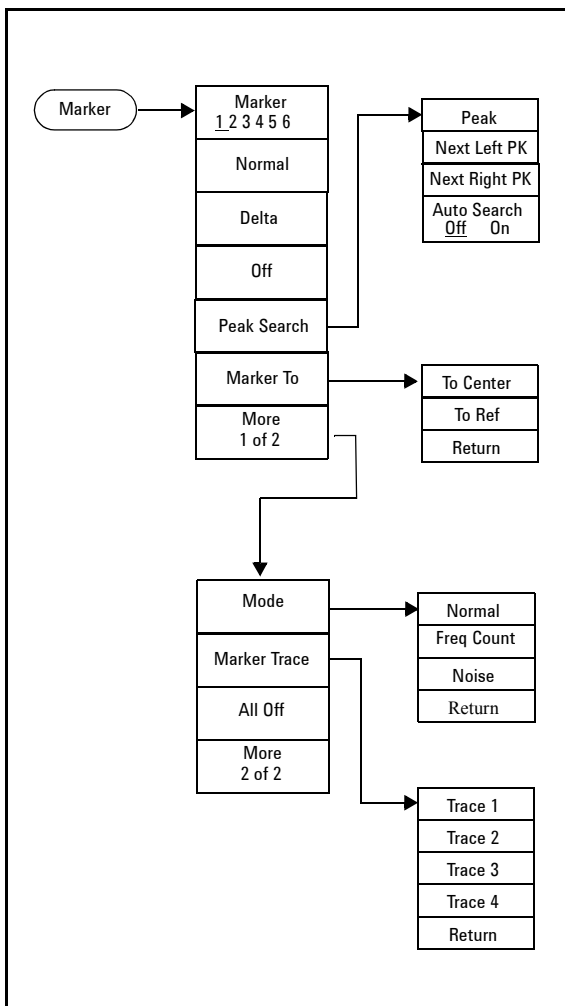
## BW/SWP



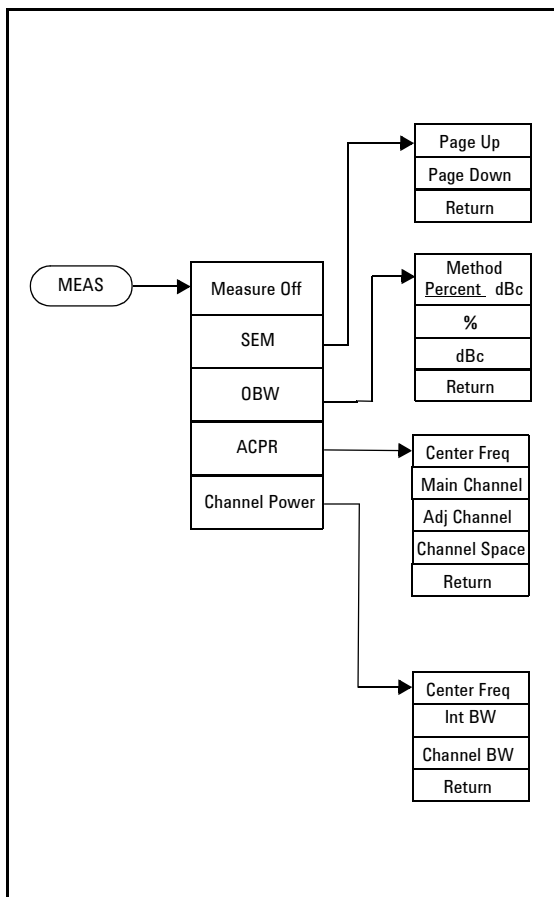
**FREQ**



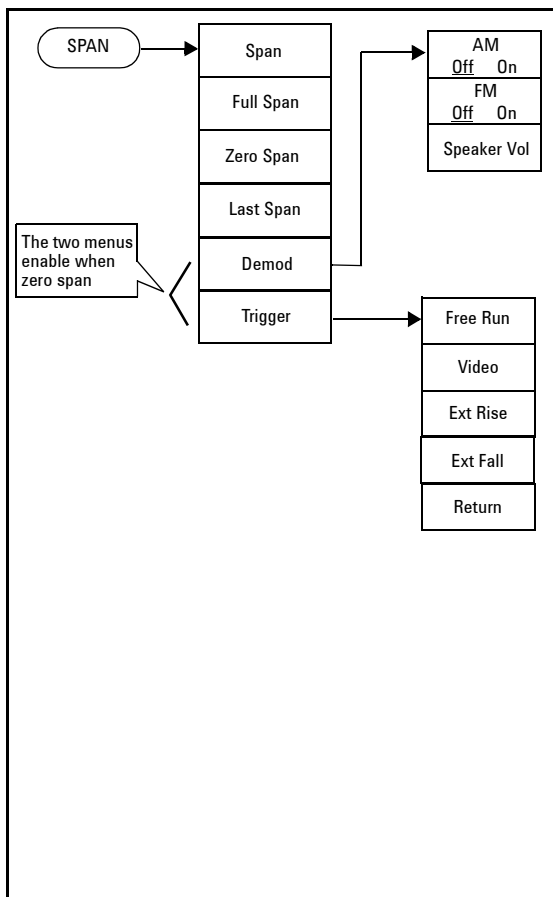
# MARKER



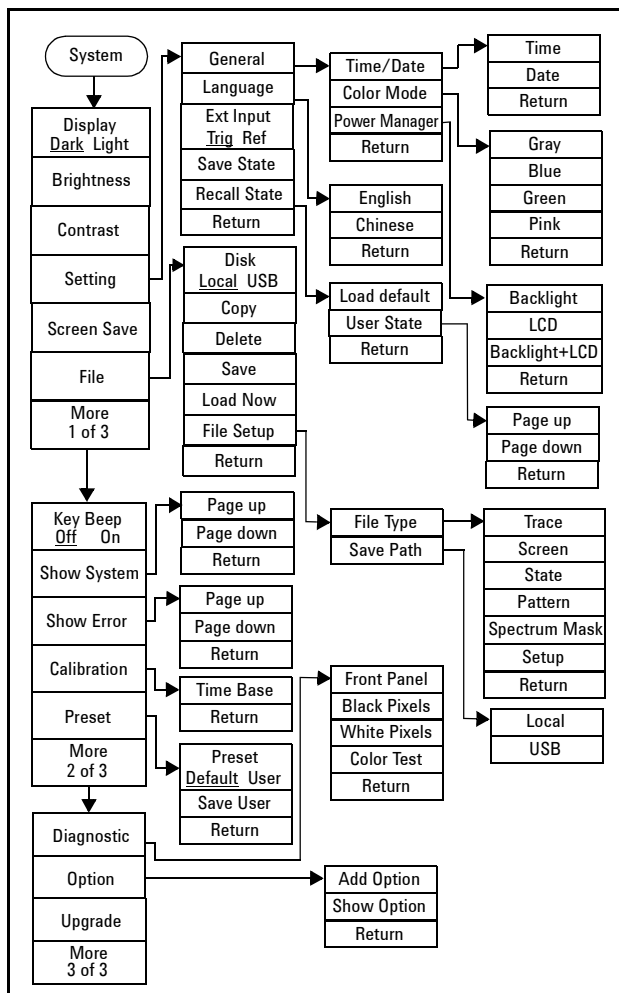
## MEAS



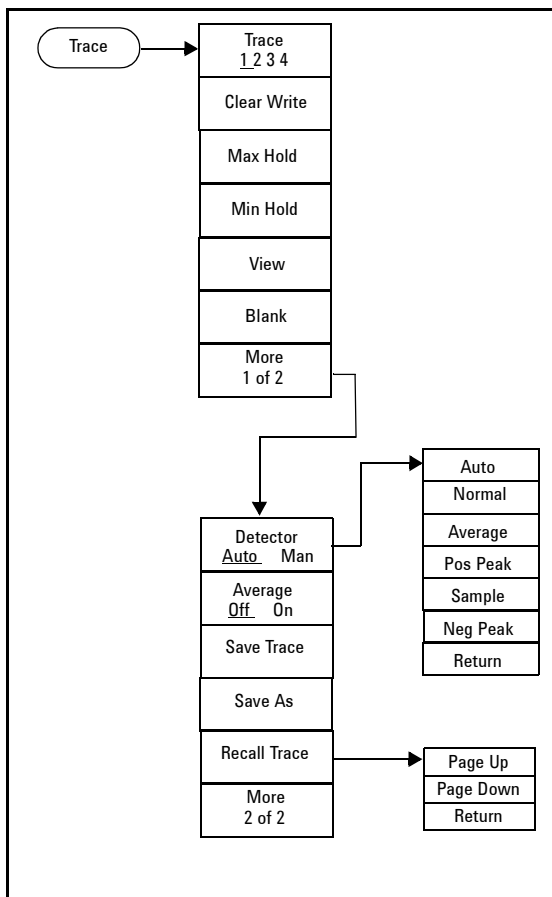
## SPAN



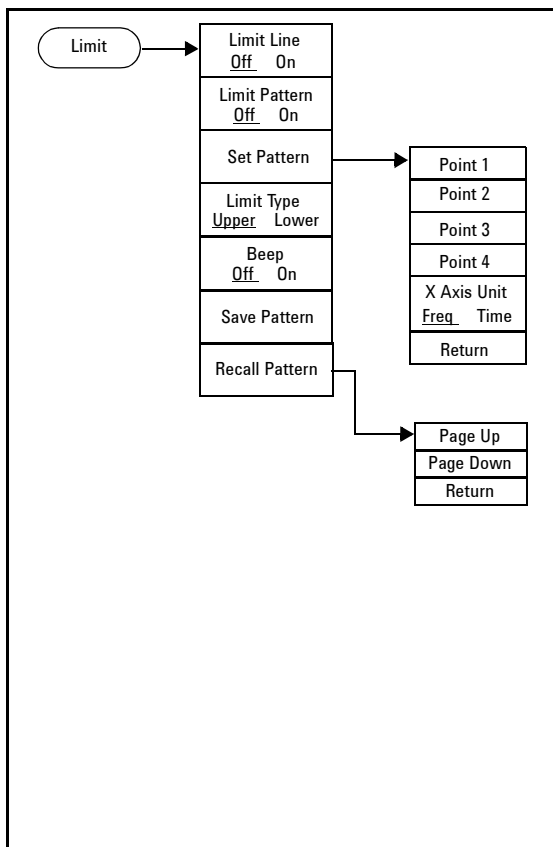
## SYS



## TRACE



## Limit



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